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My commission expires March 31, 1914.

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JULY ELECTRICAL REPORTS.

The Bureau of Foreign and Domestic Commerce of the Department of Commerce and Labor has for a long time past issued the statistics of import and export trade, under the supervision of Mr. O. P. Austin, the assistant chief of bureau, Division of Statistics. These data as applying to electrical exports have been quoted and commented upon in these columns for many years. The form of issuance has helped to an understanding of the general conditions of such export trade, which amounted in the fiscal year ending June 30 to $20,169,362. Hitherto the figures have been published under two general heads, electrical instruments and apparatus and electrical machinery. It would appear from the July returns that these classes have now been merged into one group, namely, "electrical machinery appliances and instruments." The total for July is given as $1,932,619 as compared with $1,291,929 in July, 1911. Beyond this it is not easy, and would be useless, to compare the figures of the two months as the details differ.

The items making up the handsome gross for July, 1912, are, however, as follows: Generators, $184,841; fans, $40,438, to the number of 3724; arc lamps, 492, worth $9,307; carbon-filament lamps, 96,940, valued at $14,288; metallic-filament lamps, 84,140, valued at $27,441; motors, no number given, $203,262; telegraph and wireless apparatus, $39,559; telephones, $113,626; all other, $1,299,857. It will be noted that two-thirds of the apparatus is so miscellaneous that it is lumped. Another feature of the new data is the disappearance of the details by leading countries of consumption, showing where the goods went. It would be illuminating to get this at least once or twice a year. The gross figures for the first seven months of the year compare as follows: 1910, $9,836,038; 1911, $11,269,818; 1912, $12,724,334. The improvement is conspicuous.

ENERGY TRANSMISSION FOR VICTORIA.

Of building transmission plants in these days there is no end. Such installations as in the earlier days of the art would have been heralded from one end of the country to the other do not now cause even the novice in transmission to lift an eyebrow. Roughly, about 100,000 kw at 100,000 volts is required to make the engineer really take notice of a new plant. Yet now and then there are installed plants of comparatively small size and not sensational in voltage worth bringing to the attention of our readers on account of some unusual condition which has been met or some comparatively unfamiliar method of construction. One of these is the Jordan River plant for the supply of electrical energy to Victoria, B. C., described elsewhere in our columns.

There are two features of the plant which make it of importance to the engineer and cause it to rise above the dead

level of standardization which of late years has been established for all except the largest and most important plants. These are the hydraulic situation and the line construction. British Columbia, like a portion of the adjacent coast on our own side of the line, is distinguished by extraordinarily heavy rainfall, the heaviest in fact on the northern part of our continent. Rainfall in the region near Vancouver has been known to rise as high as 160 in. One hundred inches is often passed in the region to which we are referring, and on the watershed of the Jordan River the average annual rainfall for the past four years has been about 80 in. Although it would not pass for a large stream elsewhere, having a drainage area of only 75 sq. miles, the Jordan is in fact one of the principal streams of Vancouver Island. The greater part of the area fortunately lies 1200 ft. or more above the sea, and the hydraulic possibilities of the Jordan are out of proportion to its drainage area, judged by ordinary rainfall and elevation. The watershed, being snow covered during winter about 5 ft. in depth, furnishes a great storage reservoir of slowly melting snow, which does not disappear entirely until June or even July. Then, too, the watershed is covered with heavy virgin forest, and thus carries an immense layer of spongy soil which steadies the flow of the stream to a very considerable degree. What the stream will be worth as a hydraulic proposition after the lumberman gets in his deadly work is quite another story, but that evil hour is probably some distance ahead. Nevertheless, owing to the small drainage area, there is likely to be a period of very low water in summer and fall, which must be balanced by water storage, fortunately easy to obtain under existing topographical conditions.

The transmission line, the second point of particular interest in the system, is constructed with cedar poles from 50 ft. to 60 ft. in height, each carrying three galvanized steel cross-arms. The poles are placed from 300 ft. to 400 ft. apart, and the construction thus constitutes a compromise between the costly steel tower arrangement and the dull imitation of old telegraph practice which impels the building of so many wooden transmission lines with absurdly small spacing. The pole line is intended to carry two electric circuits, one of which is now installed on one side of the pole. The circuit consists of aluminum cable, No. 2-0 equivalent, carried by suspension insulators. It would be interesting to know the cost of this extremely simple line as compared with that of the canonical "standardized" practice of Eastern transmission companies.

One feature of the line construction remains to be noted. The right-of-way passes through the very densely forested country and on account of the towering growth of fir it was necessary to clear a way in many places up to even 600 ft. in width. Approximately 20,000,000 ft. of fir timber had to be cut down to make way for the transmission system. Part of this may, of course, be marketed, but much, unhappily is unavailable for lack of suitable transportation facilities. Altogether this Jordan River plant rises far above the average level in interest and when completed by the addition of the second generating set and the extension of the storage basin it should be one of the most reliable plants in the great West.

EFFECTIVE ILLUMINATION.

An article in this issue by Mr. Preston S. Millar on efficacy of illumination gives a very comprehensive view of the general lines of progress followed in the development of illumination to its present stage. The author divides the growth of illumination into three periods. Practically, they may be described as the period of just plain light, the period of efficiency development and at present the period of artistic development, including the introduction of hygienic principles into lighting. It is not easy from this distance to see fully the influences which were at work during the first period mentioned. The crudity of the earlier results obtained with incandescent lamps was by no means entirely due to the absence of thought about better things. From almost the beginning of electric lighting there were available fairly well designed reflectors, crude, it is true, compared with the best now in use, but nevertheless possessing a high degree of utility. Nor were the esthetics of illumination by any means ignored, even twenty years ago, and a few installations very good from the artistic standpoint date from about the same period.

The period of booming efficiency practically began with the introduction of prismatic glass and other efficient competing reflectors. The illuminating engineer of that date, such as he was, virtually said to the public that lamps are now as efficient as they are likely to become for some time, and the price of energy is reasonable, therefore, in the interest of economy keep down the lighting bills by utilizing the available sources of light in a suitably efficient manner. The efficiency movement continued up to the arrival of the metallic-filament electric lamp and the mantle burners for gas, which reduced the cost of lighting to a point not previously touched. This condition of itself lessened the necessity for hunting extreme efficiencies. The Illuminating Engineering Society, as Mr. Millar states, encouraged the study of ocular hygiene, and perhaps the final touch in the way of needed stimulus was added when the tendency began to appear among the manufacturers of reflectors to standardize their products so as to make fairly efficient illumination a rather cut-and-dried affair. Efficiency was pushed not perhaps to its limit, but so far toward it that material improvements could be made only with considerable difficulty and expense.

The third period, with its work along hygienic and esthetic lines, has begun. Just now there is a tendency to go to extremes, always evident when any considerable change takes place during the development of an art. It is perhaps somewhat doubtful, for instance, whether extreme diffusion under all circumstances is worth its cost. Certainly from the esthetic standpoint it is not always desirable, and esthetics seems to be the order of the hour. The result of the present tendency will undoubtedly be good, and the steady reduction in the cost of electricity makes artistic lighting practicable under many circumstances which would have been forbidding fifteen or twenty years ago. One need not use cheap illuminants efficiently under all circumstances, and at present prices electric lighting may be freely employed as a decorative element, as well as for pure illumination. The trend of present practice, which is certainly in this direction, is well worthy of being encouraged.

The only danger is that the alleged esthetics may be pushed beyond any reasonable limit. Any such tendency will, however, correct itself in due season, so that we need not fear the ultimate results.

THE COMPARATIVE COSTS OF MOTIVE POWER FOR SMALL MACHINES.

The *Elektrotechnische Zeitschrift* has recently published an interesting article by Mr. E. Vollhardt on the comparative annual costs of service by gas engine, petrol engine and electric motor for driving small machinery in various industries. As might have been surmised, the results show that the electric motor gives the cheapest service at ordinary energy rates when the load is small and intermittent. When power is required in considerable amount and for many hours a day steadily, there is a certain point beyond which the internal combustion engine will be cheaper than the motor at the usual relative costs of gasoline fuel and electrical energy.

While experience and statistics are likely to coincide with the above conclusion, there is another reason for the popularity of the electric motor in general power distribution, and that reason is apart from costs or money valuations. It is the combined convenience, simplicity, smoothness and cleanliness of electric-motor operation as compared with engine operation of any kind. The gas engine is a very valuable device in its own field, but it requires more expert attendance and is more likely to get out of order, in comparison with the electric motor. The electric motor is a very satisfactory device for intermittent service. Its depreciation in periods of disuse is very small and it is ready for work at a moment's notice on the closing of a switch.

FLICKER PHOTOMETRY.

Two recent papers in the *Philosophical Magazine* bring the theory of the flicker photometer again to the front. One of these by Dr. Herbert E. Ives gathers on record the results of a long series of experiments on flicker and equality-of-brightness instruments. The paper is a long one and well worth detailed study. The chief points brought out are that the flicker method is the more sensitive and more uniform from time to time and observer to observer; that a reversed Purkinje effect and a reversed yellow-spot effect appear at low illuminations in using the flicker instrument, and that the results with the two types of photometer agree fairly well when using small fields of view and high illuminations. With these facts before us we are little nearer to knowing the real action that takes place in the flicker photometer than we were when it was invented many years ago.

As regards the matter of sensibility in the photometry of colored-light sources, most observers will probably agree with Dr. Ives so far as very different colors are concerned. For moderate and slight differences the advantage of the flicker instrument is much less marked, and in the latter case most observers find it less consistent than the equality-of-brightness instrument. Its best qualities are displayed in comparing, say, arc and incandescent lamps. However, it is as easy to work with as is the contrast screen when the latter is used with small color differences. The same situation is probably true of reproducibility from time to time and observer to observer. In other words, the flicker instrument is admirable for heterochromatic work, but the observer must not conclude that it holds the highest rank for sensitiveness in general. With respect to the reversed Purkinje effect, it has recently been shown that many of the difficulties of the equality-of-brightness method are attributable to the shift of luminosity values by simultaneous contrast, and that apparent reversed Purkinje effects are certainly within the range of possibility from this cause, so that, as Dr. Ives suggests, such results may be associated in the flicker experiments with the color of the comparison light. He has done admirable service in proving that fairly concurrent results by both methods may be had by using plenty of light and a small field.

There is left unanswered the fundamental question as to why color flicker vanishes before brightness flicker and thus wipes out simultaneous contrast and renders the observer able to make a color-free balance. If one could use the flicker method best with peripheral vision and at low illuminations, he might comfortably fall back on the "Duplicitäts-Theorie." Unhappily these are not the facts, and whatever the real cause may be it must be ascribed to that part of the retina occupied almost exclusively by cones. The question remains as to what is the physiological process that comes into play and causes absence of color flicker while the brightness flicker remains. Lord Rayleigh has come to the rescue in a brief note in the *Philosophical Magazine* suggesting that the adjustment of the iris may be the important matter, pointing out that there must be some relative value of, say, red and green light that tends equally to close the iris and thus to establish absence of flicker. The proposition is an interesting one, yet it does not touch the root of the matter; that is, the disappearance of color flicker, leaving a smoothly blended color field still affected with a conspicuous brightness flicker. One can readily imagine a balanced pupillary reflex due to balanced luminosity of the two fields, but this conception does not in the least explain why color blending takes place prior to the luminosity balance that brings absence of flicker. In point of fact, the pupil is so far from quiescent even in the most uniform light that the hypothesis could hardly be proved or disproved by experiment.

After all, what reason is there to assume that the color blending is not psychological rather than physiological? One can fuse red seen with one eye and green seen with the other into a resultant yellow as well as if the performance were monocular or by ordinary b'ending, and there is no apparent reason for supposing that the two cases involve two distinct processes. If color blending be cortical rather than retinal, it might well have the time-constants of its own independent of those involving mere brightness values. It is throwing too heavy a responsibility on the retinal structure to hold it responsible for all the infinite details of the sense of sight. This whole matter is a problem lying in the debatable ground that forms a no-man's-land at the boundaries of physics, physiology and psychology. The several classes of investigators should co-operate in its solution.

ANNUAL MEETING OF THE EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.

The annual meeting of the Empire State Gas & Electric Association was held in the Engineering Societies Building, New York, on Oct. 9, Mr. R. M. Searle, of Rochester, presiding. Approximately sixty representatives of the central stations of the State were in attendance. The session was given over entirely to executive business, so that no details are available for publication in the technical press. The officers for the coming year are as follows: President, Mr. C. G. M. Thomas, of the New York & Queens County Electric Light & Power Company, Long Island City; first vice-president, Mr. J. T. Hutchings, Rochester Railway & Light Company; second vice-president, Mr. J. C. DeLong, Syracuse Lighting Company; treasurer, Mr. Stuart Wilder, Westchester Lighting Company, Mt. Vernon; secretary, Mr. C. H. B. Chapin, New York. The executive committee, to serve for two years, is composed of the following: Messrs. H. W. Peck, Schenectady Illuminating Company; H. M. Beardsley, Elmira Water, Light & Railroad Company, and G. M. Cole, Plattsburgh Gas & Electric Company.

KANSAS ELECTRIC ASSOCIATION PROGRAM.

The fifteenth annual convention of the Kansas Gas, Water, Electric Light and Street Railway Association will be held at Manhattan, Kan., Oct. 17, 18 and 19. Special efforts have been put forth to make this the most successful meeting held thus far in the history of the organization. Among the papers scheduled for presentation, as announced in the preliminary program, are: "Why the Cost of Living Is High," by Mr. H. J. Waters, president of the Kansas State Agricultural College, Manhattan; "Relation of Interurbans to Community Development," by Mr. W. A. Scothorn, Hutchinson; "New Alternating-Current Devices," by Mr. F. N. Jewett, St. Louis, and "Central Energy for Manufacturing Plants," by Mr. Gordon Weaver, Kansas City. There will also be a paper on "Plant Records," and one on the "Economic Combustion of Coal." Addresses will be delivered by Messrs. L. O. Ripley, Wichita; H. W. Prents, Jr., Pittsburgh, and Ivor F. Thomas, Wichita. Arrangements have been made for a visit of the delegates to the hydroelectric plant 6 miles from Manhattan, and to the Kansas State Agricultural College where over 2000 students are in session. The secretary-treasurer of the association is Mr. James D. Nicholson, Newton, Kan.

COMMERCIAL SECTION N. E. L. A. EXECUTIVE COMMITTEE MEETING.

A meeting of the executive committee of the Commercial Section of the National Electric Light Association was held at the Hotel Touraine, Boston, on Oct. 3 and 4. Chairman E. W. Lloyd, Chicago, presided, Mr. E. L. Callahan, Chicago, being secretary. Fourteen out of a total membership of seventeen were present, including Messrs. S. V. Walton, San Francisco; T. I. Jones, Brooklyn; F. H. Gale, Schenectady; E. McLeavy, Detroit; R. C. Rypinski, Pittsburgh; F. B. Rae, New York; J. C. McQuiston, Pittsburgh; Douglass Burnett, Baltimore; J. Robert Crouse, Cleveland; J. F. Becker, C. A. Littlefield and George Williams, New York. The meeting was occupied by the reading and discussion of the reports of the financial committee, the committee on Commercial Digest, and the naming of officers and members of the eight committees in charge of the detailed work of the section. It was decided to hereafter issue the Commercial Digest sheets quarterly under the name of the *Electrical Salesman's Handbook*. The next meeting will be held at Chicago on Monday, Dec. 9.

SOCIETY FOR ELECTRICAL DEVELOPMENT.

At a meeting held in the Engineering Societies' Building, New York, on Oct. 3, a reference to which appeared in our previous issue, the Society for Electrical Development was organized by the committee which was appointed for the purpose of forming a co-operative association at the gathering of representatives of the Electrical Supply Jobbers' Association, the National Electrical Contractors' Association, the National Electric Light Association and of some of the electrical manufacturers at Association Island, Lake Ontario, on Sept. 3.

A list of the members of the committee appeared in the issue of Sept. 7. Messrs. Einstein and Montague were not present at the meeting on Oct. 3, and Messrs. Swope, Layman and Osborne were represented by Messrs. Rockefellow, Goldschmidt and Nicholson respectively. Others present were: Mr. Franklin Overbaugh and Mr. T. M. Debevoise, secretary and general counsel, respectively, of the Electrical Supply Jobbers' Association; Mr. T. C. Martin, secretary of the National Electric Light Association, and Mr. W. H. Morton, secretary of the National Electrical Contractors' Association. The meeting lasted all day. Papers of incorporation under New York laws and a constitution and by-laws for the society were drawn up and have been submitted to attorneys for examination as to legality. Details of financing have not been completed, but an equitable assessment on the annual income of subscribers has been spoken of as a possible basis for the financial plan. Directors and officers will be chosen at the next meeting, which is scheduled for Oct. 18. A central publicity bureau, which will do much of the educational work that the association hopes to accomplish, will be established.

BOSTON ELECTRICAL JOVIANS.

What was said to be the most enthusiastic rejuvenation of the Order of the Sons of Jove since the formation of this electrical fraternity took place in Boston on Oct. 7 under the leadership of Mr. Robert L. Jaynes, who, as Jupiter, is the highest officer of the order. One hundred and forty-two new members were received into the organization, the initiatory ceremonies being performed by a special degree team from New York in charge of Mr. F. E. Watts, consisting of Mr. George Feher as Mars, Mr. C. L. Hight as Vulcan, Mr. W. V. Dolan as Pluto, Mr. A. E. Farrenkopf as Hercules and Mr. J. E. Morey as Neptune.

Credit for the success of the rejuvenation is given to Messrs. Charles H. Hodkinson, statesman for Massachusetts; L. D. Gibbs, chairman of the membership, S. B. Condit and W. J. Keenan.

Elaborate preparations are being made for the next annual Jovian congress, which will be held in Pittsburgh from Oct. 14 to 16, the expectation now being that fully 1000 members will be in attendance.

FIRST INTERNATIONAL CONGRESS OF ELECTROCULTURE.

The first International Congress of Electroculture and of the Applications of Electricity to Agriculture, Viticulture and Horticulture will be held at Reims, France, on Oct. 24-26. The congress will be given under the auspices of the French Society of Motoculture and the Agricultural Commission of Reims. In conjunction with the congress there will be an exhibition of agricultural machinery and numerous demonstrations of motor-driven agricultural implements. An international association for electroculture will be formed at the close of the congress.

PRINCIPLES AND POLICIES OF THE NEW ENGLAND ELECTRIC DEVELOPMENT ASSOCIATION.

Officers of the Electric Development Association have prepared for submittal to the membership on Oct. 23 a declaration of principles and statement of policies which were formulated at a meeting held with the executive and advisory boards in Boston on Oct. 2.

According to the declaration of principles the electrical industry as a whole divides itself naturally into two general branches. First, the manufacture, sale and erection of energy-consuming and energy-handling devices, and second, the manufacture, distribution and sale of electrical energy. The interests of these two branches are mutual, and therefore anything which advances the interests of one must be beneficial to the other. The service rendered in the second general branch of the industry is entirely the province of the central station, which can best increase its business by the protection of the manufacturer, the jobber and the contractor, and by co-operating with them in an effort to educate the consumer in the use of electricity. The following out of the National Code Rules to the letter by all members is of the greatest importance.

According to the statement of policies, the manufacturers should co-operate with the association to introduce new appliances and demonstrate the present appliances to the public. The central station should carry on active campaigns in general advertising for the instruction of the general public, and should use their influence to encourage the dealers and contractors. The jobber should discontinue all forms of installation work and discourage the handling of anything but standard approved material; they should co-operate with the association and with the manufacturers, central station and contractor to advertise new goods. The contractors should confine their business to the installation of electrical materials and to the retailing of materials and devices; they should endeavor to influence owners to install suitable wiring for the accommodation of future extensions of energy-consuming devices.

There were present at the meeting all of the officers of the association, four of the six members of the executive board and sixteen of the twenty-eight members of the advisory board, those present being thoroughly representative of the electrical industry in New England. The executive and advisory boards and officers of the association believe the movement to be necessary in order that an unbiased, new and unrestrained body may take up the definite work of starting with local conditions and improving them along broad lines and through the co-operation of all businesses interested in the electrical industry, rather than to work from a national association back to a local condition.

NORTH CAROLINA ALUMINUM WORKS.

Seven vertical waterwheel type electric generators, which represent units of the largest rating ever built for generating direct current, will be installed in the new plant of the Southern Aluminum Company at Whitney, N. C. Each machine will have a rating of 5000 kw, delivering 20,000 amp at 250 volts and operating at a speed of 170 r.p.m. Two smaller direct-current generators of the same type, rated at 2500 kw at 300 r.p.m.; two 1250-kva alternators, having a speed of 514 r.p.m., with two 16-kw exciters, and all necessary switchboard and controlling devices are also included in the installation, which will be one of the largest and most modern of its kind in the world. It is the intention of the Southern Aluminum Company to push to completion the project now under way and to have in operation in the course of the next eight months a manufacturing plant that will turn out some 25,000 tons of aluminum annually.

The company was recently incorporated under the laws of the State of New York with a capitalization of $8,000,000 and was organized by some of the largest aluminum manufacturing companies of Europe. The enterprise has been financed in France and is closely associated with l'Aluminium Français, of Paris. The work at Whitney is in charge of Dr. R. Heroult. Although he has been directing constructive operations there only a few weeks, remarkable progress has been made, and it is confidently expected that the entire plant will be in readiness for turning out the product of the company by the middle of 1914. It is said that the plant throughout will rank among the most perfectly equipped for the manufacture of aluminum in the United States. Only one other in the country, at Niagara Falls, can compare with it. In the complement of buildings are nine furnace rooms, wherein the alumina will undergo the various processes incidental to conversion into aluminum. Each of these structures measures 60 ft. by 500 ft., and one electrode factory of similar dimensions is also included in the group.

The generators will be installed immediately over wheel pits and directly connected to vertical shafts of S. Morgan Smith turbines by forged steel flanged couplings. Each 5000-kw generator will weigh in the neighborhood of 150 tons, measure 22 ft. in diameter and extend 13 ft. above the floor level. The entire rotating element of the generators will be supported from an overhead thrust bearing. While the normal speed will be 170 r.p.m., they will be designed with provision for a safety runaway speed of 75 per cent above normal. The wheel governors will be provided with remote electric control for both hand and automatic operation. The electrical equipment will be supplied by the General Electric Company.

DEVELOPMENT PLANS OF THE NIAGARA, LOCKPORT AND ONTARIO POWER COMPANY.

Approval has recently been secured from the Public Service Commission for the Second District of New York State for the transfer to the Niagara, Lockport & Ontario Power Company of the capital stock of the Salmon River Power Company, which was formerly the Oswego County Light & Power Company, the total outstanding stock being 7500 shares of $100 par value each. This secures to the Niagara company the hydroelectric development on the Salmon River, which is now under construction, some 40 miles north of Syracuse. In order to acquire this stock the Niagara company is authorized to issue its preferred stock to the amount of $750,000. The approval of the Public Service Commission carries with it authority for the execution of a mortgage by the Salmon River Power Company upon all of its property to secure its forty-year 5 per cent bonds to the amount of $5,000,000, and to issue $2,353,000 of bonds at 85, the proceeds to be employed in the construction of a dam, transmission line and for acquiring the necessary auxiliary equipment. The Salmon River company is also authorized to lease its entire system to the Niagara company at a rental equal to one and three-quarter times the interest on the bonds. These bonds are guaranteed by the Niagara company.

One of the provisions in the formal consent of the commission is that in any investigation or inquiry by the commission or other lawful authority into the rates or charges for any electric energy generated at the Salmon River plant, whether such rates are made by the Niagara company or by any other person or corporation, the rental provided by the lease shall not be deemed as material or conclusive in any respect as to the reasonable price or rate to be charged for energy to the consumer, and the commission will be at full liberty to inquire into the actual cost of generation and base its determination upon such cost and other material facts without regard to the rental.

The acquirement of the Salmon River property by the Niagara, Lockport & Ontario Power Company was deemed necessary in view of the increasing demand for electrical energy in the Syracuse district and the desirability of avoiding the construction at great expense of a new transmission line from Niagara Falls to Syracuse, a distance of 154 miles. The plans for the initial development of the Salmon River project include a generating plant of 15,000 hp present capacity, 42 miles of 60,000-volt, two-circuit, steel-tower transmission line and a storage reservoir of 1,000,000 cu. ft. capacity. The Salmon River company owns approximately 8000 acres of land, situated about 42 miles northeast of Syracuse, including the river bed of the Salmon River for a distance of approximately 12 miles, in which distance the river has a fall of 330 ft. A concrete dam 600 ft. long is being built on solid rock foundation in order to create the reservoir, which will have a superficial area of about 4 square miles. The storage capacity can be more than doubled by raising the dam 11 ft. The drainage area above the dam is 191 square miles in extent and lies on the westerly slope of the Adirondacks in a region which has one of the heaviest rainfalls in the state. The transmission line will be carried on private right-of-way, sufficiently wide to permit of a duplicate tower line. The construction features present no unusual difficulties from an engineering standpoint. The contract for the construction of the dam and the power house was recently awarded to the John F. Stevens Construction Company, 55 Wall Street, New York City, as noted on page 634 of our issue of Sept. 21.

The Niagara, Lockport & Ontario Company is now operating its transmission system at practically the full capacity of 60,000 hp. By supplementing the Niagara supply with the energy transmitted from the Salmon River development the company asserts that it will not only be in a position to increase its business in Buffalo and in the territory between Buffalo and Syracuse, but will also be able to improve the quality of service in the Syracuse district by reducing the interruptions to a minimum. The Niagara company has contracts with lighting and railway companies in the Syracuse district which operate 160 miles of electric railway, besides lighting Syracuse, Auburn and the territory served by the Oswego River Power Transmission Company, which includes Baldwinsville, Fulton, Oswego, Hannibal, Phoenix and the Oswego River valley. The average demands of these companies during 1912 were more than two and one-half times the demands in 1908.

"HUMAN ENGINEERING."

Taking "human engineering" as his subject, Mr. Alexander D. Bailey, assistant chief engineer of the Fisk Street and Quarry Street generating stations in Chicago, read a short paper before the technical division of the Commonwealth Edison Company Section of the National Electric Light Association on Sept. 26. Technical men, said Mr. Bailey, are interested in the data of material engineering accomplishment, but there is a wide field of human relations that is still more important. When engineering is defined it is seen that it is a very broad subect, and the human side of technical engineering—that is, the interrelations of men in organizations—has been neglected.

No formulas or rules exist for carrying out processes of "human engineering"; no preliminary training is given anywhere in its finer points. There are rules of morality and of conduct, but in the nicer relations of men with their fellows scientific adaptability must come as the result of practical experience. But study of these human relations is as valuable to the engineer or the technical man as is study in any branch of material engineering. The smooth running of a group of men surpasses in importance the invention of any machine or device, and it is truly engineering to achieve this smooth running.

OPENING OF ELECTRIC-RAILWAY CONVENTIONS IN CHICAGO.

On Monday, Oct. 7, the thirty-first annual convention of the American Electric Railway Association and its affiliated associations of accountants, engineers, claim agents and traffic managers was begun in Chicago. Convention headquarters were established in the International Amphitheater on South Halsted Street near Forty-second Street, several miles from the "downtown" district, but in a building giving ample accommodations for a very large and excellent collection of exhibits. Meetings were held in the adjacent Saddle and Sirloin Club—a social organization, obtaining its unusual name from the fact that nearly all of the members are connected with business establishments in the Union Stockyards. The attendance was large, the number registered at the close of the first day being estimated at over 2000.

Decorations of a varied nature made the exhibit halls attractive. A large space adjoining the main entrance to the central hall was arranged as a formal garden, with grass plots, flower beds and concrete walks. Surrounding this garden and the large exhibit spaces around it were a row of stately electric-light standards that were striking and unique. These fluted columns were about 9 ft. high and 14 in. in diameter, and each one supported a globe. Both column and globe were of translucent, white moonstone glass and were lighted from within by tungsten lamps. The effect was dignified and pleasing. General illumination was obtained by "sunbursts" of 100-watt tungsten lamps suspended from the ceiling. Electrical energy for lighting and for operation of exhibits was obtained from the nearby plant of the Union Stockyard & Transit Company, which owns the amphitheater. Mr. H. G. McConnaughy, of New York, the director of exhibits, designed the lamp columns for the occasion.

FIRST SESSION OF ENGINEERING ASSOCIATION.

Four of the affiliated associations held opening sessions on Monday afternoon. At that of the American Electric Railway Engineering Association President E. O. Ackerman, of Columbus, Ohio, presided. In his annual address he made the interesting suggestion that members attending the convention make a written report to the executive officers of their respective companies on returning home. In this report the engineer might state what items of information obtained at the convention were most valuable to him and suggest how this information could best be applied to local needs.

Mr. Norman Litchfield, of New York, made reports for the executive committee and for himself as secretary-treasurer.

RECOMMENDATIONS RELATING TO ENERGY DISTRIBUTION.

Nearly all the first session of the engineering association was devoted to a consideration of the report of the committee on power distribution, presented by Mr. G. W. Palmer, Jr., of Boston, chairman. The committee made a number of recommendations, and all were adopted except one relating to the use of trolley guards at grade crossings with steam railroads. The committee reported against the use of trolley guards, except possibly in unusual cases, but the association was about equally divided for and against this form of protection, and the subject was referred back to the committee.

JOINT USE OF POLES.

In relation to the specifications for the joint use of poles, the committee pointed out the need of a standard form of agreement. Reference was made to the work of the committee on overhead-line construction of the National Electric Light Association. The formation of a joint pole committee was announced with membership thus far as follows: American Telephone & Telegraph Company,

Messrs. H. S. Warren and F. L. Rhodes; National Electric Light Association, Messrs. Farley Osgood and W. T. Oviatt; American Electric Railway Association, Mr. W. J. Harrie and Prof. A. S. Richey. It is expected that the American Institute of Electrical Engineers, the Association of Railway Telegraph Superintendents and the Railway Signal Association will also be represented on this committee. In view of the formation of the new committee, the committee on power distribution was discharged from further consideration of the subject.

There was considerable discussion on the joint-pole question. Mr. William Roberts declared that the prime factor to be considered was the safety of linemen. There should be a clear space of 15 in. on each side of the pole, making an opening of 30 in. between wires for the lineman to climb through. Professor Richey said the railway men took the position that vertical attachments, like transformers, should be on the "face" of the pole, leaving the "back" free for climbing through the 30-in. space. Telephone cables should not be attached to the pole by a bracket in the case of joint use, but suspended from a cross-arm like all other wires and cables. Apparently the railway and electric-light men are in agreement on this subject, but the telephone men are inclined to object to cross-arm suspension of telephone cables.

Tentative specifications for overhead crossings of electric railway wires have been adopted, but the subject is still under discussion with other parties at interest. The committee was authorized to continue its investigation of the so-called 30 per cent para rubber compound in order that it may submit standard specifications at the 1913 convention. In reference to stranded cables, the committee recommended the adoption of the proposals of the United States Bureau of Standards covering the properties of bare concentric cables, and this action was approved. Certain changes in wording, based on the "annealed copper standard" were made in the association's standard copper-wire tables. The standard specifications for both single-conductor and three-conductor, paper-insulated, lead-covered cables for 1200-volt service were revised in certain respects. The committee called attention to the present situation in regard to standard specifications for overhead crossings of electric light and energy transmission lines. The N. E. L. A., the steam railroad interests and the electric railway associations have severally adopted specifications for such crossings. The committee feels that final action on the subject should be taken only after careful consideration with respect to the legal aspects of the matter and the position taken by public service commissions and municipalities. However, the specifications adapted by the association have been revised and are approved as "recommended practice," subject to further conferences to be held with the other interests involved.

BLOCK SIGNALING.

Meetings of the accountants', claim agents' and transportation and traffic associations were held on Monday afternoon, and on Tuesday morning there was a joint meeting of the engineering and traffic associations. The report of the joint committee on electric-railway block signals was presented and discussed. Interurban-railway men from Indiana reported favorably as the result of experience with block signaling. Mr. Charles L. Henry gave a description of the Simmen signal equipment as used by the Indianapolis & Cincinnati Traction Company. He said that for interurban service the continuous track-circuit automatic block-signal system is not wanted. Another point brought up is that arc head-lamps make red signals look white, but this statement was doubted. There was considerable discussion on the subject of signaling, and afterward the report of the joint committee on train operation was taken up.

Our next issue will contain an account of the concluding session of the convention.

CONVENTION OF STEEL MILL ELECTRICAL ENGINEERS.

The first three days' sessions of the Association of Iron & Steel Electrical Engineers in convention at the Hotel Pfister, Milwaukee, Sept. 30 to Oct. 5, was reported by telegraph in our issue of last week. Following is an account of the papers and discussions presented at the convention:

MIXED-PRESSURE TURBINE AND STEAM REGENERATOR.

In a paper by Mr. E. D. Dickinson, General Electric Company, Schenectady, N. Y., presented Monday afternoon, was described the development of mixed-pressure turbines of three classes: Low-pressure turbines with live-steam admission valves; turbines with separate low-pressure and high-pressure valves, and turbines having complemental operation of these sets of valves. Best operating conditions and efficiency are usually obtained by arranging the governor to control the low-pressure valve, except where admission of atmospheric pressure into the exhaust line may make a flow-regulating valve necessary. Tables of steam regenerator capacity were given, and an example cited in which a 240,000-lb. regenerator carried a 1500-kw turbine load 7 per cent of the time, saving $895.50 per month. If the engine be shut down more than three minutes, twice each hour, an additional net saving of $335 per month would be obtained.

Mr. Barton Stevenson, Pittsburgh, Pa., declared the mixed-pressure turbine to be a compromise between high and low-pressure designs, affirming mill experience to favor the simplicity of straight low-pressure operation in which the unit, its generator locked onto the bus, acts as a third cylinder of the engine. When mill engines are down, he said, the boilers usually blow anyway, so that this wasted steam may as well be utilized in low-pressure turbines, efficiency being at the time out of the question. Mr. H. M. Gassman, Birmingham, Ala., insisted that there may be little economy in attempting to absorb peaks, since increase in regenerating capacity brings small return on investment. Mr. W. T. Snyder, McKeesport, Pa., recited his troubles with pressure-reducing valves, which were later replaced by piston valves. Another speaker, taking the author's figures, declared the regenerator to be hardly worth while on a mill-practice basis if carrying load only 7 per cent of the time. With coal at $2, he estimated the saving to be about $1,400 yearly in return for a regenerator outlay of $20,000. Capitalists, he said, more often demand a return of 20 per cent when asked to install such fuel-saving devices. Mr. J. H. Wilson, Middletown, Ohio, thought regenerator expense hardly warranted with mixed-pressure turbine. Messrs. O. R. Jones, Youngstown, Ohio; J. C. Reed, Steelton, Pa.; E. J. Cheney, Schenectady, N. Y.; B. R. Shover, Youngstown, Ohio; T. E. Tynes, Buffalo, N. Y., and A. B. Bartholomew, Donora, Pa., also spoke briefly.

STEEL-MILL POWER PROBLEMS.

"Power Problems in Steel Mills," presented by Mr. Wilfred Sykes, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., described and quoted operating data on turbine-driven blowers, turbo-alternators and gear-connected direct-current turbine-generators, boilers fired with blast-furnace gas, gas-engine-driven generators, high-pressure steam turbines, low-pressure turbines with engines, and motor drive of rolls and mill auxiliary equipment. A number of efficiency curves were included in the paper, which unqualifiedly recommended electric operation in competition with all other drives, even under the most severe conditions.

Mr. R. Tschentscher, South Chicago, Ill., observed that the fallacy of placing too much weight on original analyses is nowhere better exemplified than in the steel business. A 20,000-ton mill is designed for an energy consumption of, say, 50 kw-hr. per ton of material, but later this rating is

far overreached. One mill, for example, rated at 8000 tons, is now regularly producing 23,000 tons per day. Motors do not "lie down" like steam engines when overloaded, so that no warning is given to the operator to ease up until the limit of the machine has been passed. The allowance of ample reserves, declared Mr. Tschentscher, greater than is the present practice, will effect tremendous savings. Mr. F. W. Stevens, Ambridge, Pa., cited a European plant using a 1000-kw turbine to drive a three-high mill through double gears. Mr. J. H. Wilson, Middleton, Ohio, mentioned a German installation in which a low-pressure turbine drives a bar mill through helical gearing, utilizing the rolling-mill-engine exhaust. Messrs. B. G. Beck, Gary, Ind., F. W. Stevens, T. E. Tynes and James Farrington also spoke briefly.

ILLUMINATION CALCULATIONS.

Mr. C. J. Mundo, Schenectady, N. Y., presented a collection of curves and data for making illumination calculations for various illuminants, including flame-arc lamps, tungsten lamps, etc. A useful feature was a table of constants giving the horizontal illumination for various heights and distances from the source. Mr. B. W. Gilson told of the need of frequent cleaning of reflectors. Mr. Ward Harrison, Cleveland, Ohio, recommended using 220-volt lamps on 220-volt systems, instead of two in series, thereby simplifying the wiring and arrangement. When alternating current is available, a 110-volt transformer will, of course, be most advantageous. Mr. James Farrington reported 9000 hours' life obtained by running ten 25-volt lamps in series on 250 volts. Mr. Parkhurst next paid a high personal tribute to the work done by Mr. Mundo in improving mill lighting. This, he declared, has actually increased the tonnage output. Mr. B. R. Shover confirmed these expressions, adding that proper lighting has also reduced accidents and greatly improved working conditions in the mills.

LIGHTING OF STEEL MILLS.

In a paper entitled "The Incandescent Lamp in the Steel Industry" Mr. Ward Harrison, General Electric Company, Cleveland, Ohio, discussed the principles of light flux and distribution, illustrated by practical data on reflector characteristics. The author also showed examples of shop, mill and furnace-room lighting using large tungsten units. These lamps gave higher intensities and saved the trimming formerly required with the flame-arc lamps. In the discussion Mr. H. M. Gassman referred to aluminum paint as a reflecting material. Mr. Switzer described a new compact illuminometer adapted to the use of inexperienced observers. Mr. C. J. Mundo said that practical men are still disposed to cling to flat reflectors, although dome units, hung higher, will give the same effect in distribution.

Mr. C. E. Clewell's paper on "Modern Illumination in the Iron and Steel Industry," read by Mr. C. E. Stephens, Pittsburgh, Pa., opened Thursday's program following the recess of Wednesday. After showing the economic necessity for adequate lighting and describing the modern illuminants available, the author cited particular examples of foundry, open-hearth, machine-shop, erecting-shop, carpenter and pattern-shop lighting, using carbon arc, incandescent and mercury-vapor tube lamps. The deserved importance of proper yard lighting was also touched upon, and the paper closed with tabulations of lamps used and complete lighting data on a number of mill and industrial installations.

Opening the discussion of the paper, Mr. Ward Harrison, Cleveland, Ohio, showed photometric curves of flame-arc lamps taken at ten-second intervals, revealing light variations from 500 to 3000 cp, despite the steady storage-battery supply of the arc and general favorable laboratory conditions of the test. Mr. F. D. Egan, Midland, Pa., confirmed the necessity for higher illumination in steel mills, but warned against hanging lamps too high, with consequent loss of efficiency. He exhibited photographs of the lighting of open-hearth rooms. The life of arc lamps rated normally at 175 hours per trim under favorable conditions is reduced, he said, to 115 hours and less, when operated on traveler bridges or off circuits with motors. Mr. G. W. Richardson, Philadelphia, recommended the use of 250-watt tungsten lamps on cranes. Mr. E. Trudlander, Braddock, Pa., remarked that his safety department requires two 250-watt lamps on each crane. These units have not suffered from the jar of crane travel and concentrate the light where men are working, saving other yard illumination. Mr. James Farrington, Steubenville, Ohio, told of operating two 125-volt 100-watt lamps in series on each of forty cranes, securing an average life of 1300 hours. Mr. E. B. Rowe, Newark, Ohio, referred to the necessity of cleaning reflectors often to get good illumination. Mr. C. J. Mundo advised separate circuits for lamps and motors. Pressure variations on motor lines produce flicker and may even cause some units to go out. Light is also most needed when a breaker has tripped on a motor circuit.

ENERGY DISTRIBUTION.

Mr. W. D. Ligon opened the Thursday afternoon session with a discussion of underground systems of distribution, tracing development from the Edison tube to pump logs, clay tile and fiber conduit. Detailed data of fiber-conduit construction were included, and the paper closed with a tabulation of equivalent costs of installing single-duct and multiple-duct tile and fiber-pipe conduit, computed to a trench-foot basis.

In a paper entitled "Underground Cables" Mr. Charles R. Sturdevant described the various single and multiple conductor cable made by the American Steel & Wire Company, use of varnished cambric and paper insulation, composite cables, methods of forming joints, etc.

A paper on "Tubular Poles for Line Construction," by Mr. W. T. Snyder, electrical engineer for the National Tube Company, McKeesport, Pa., covered applications of steel poles, ease of cutting and jointing, etc. A mass of detailed data on pole sizes, strengths, loads and deflections was also presented. Tests quoted by Mr. Snyder show that for hollow poles both strength and stiffness increase more rapidly than the weight as the diameter is increased.

Mr. R. A. Cummings' paper, "Reinforced Concrete Poles," contained detailed construction data and covered several tests made by the New York Central Railroad, in which deflection of concrete poles and foundations was carried to destruction with the aid of a locomotive and dynamometer car. Comparing concrete and chestnut poles the author showed a saving of 40 per cent on 25-ft. lengths and 17 per cent on 40-ft. lengths in twenty-five years' service.

A paper on "Structural Steel Poles and Towers," presented by Mr. R. Fleming, New York, related to subjects of loading, unit stresses, foundations, etc., of fabricated structures, and was illustrated with detailed descriptions of the steel towers used on several American and foreign transmission lines, special river crossings, etc. The author recommended strongly the use of heavier steel sections in poles and towers to contribute to longer life of the structures.

Mr. R. B. Freeman presented the paper scheduled to have been given by Mr. W. W. Grant, and exhibited a number of lantern slides showing conduit installations made by Mr. G. M. Gest. The slides illustrated methods of installing fiber duct in concrete, arrangement of manhole forms, using steel, wood, etc., and methods of splicing cable. The first cost of the duct itself is such a small fraction of the outlay for underground work that the use of the best tube obtainable represents the best economy.

In the joint discussion on the general subjects covered by the distribution papers, Mr. L. R. Rankin, Sharon, Pa., described the construction of some 25-ft. concrete poles completed at a cost of $7.50 each, equivalent wood poles costing $4 to $5. On test the 25-ft. concrete and chestnut poles showed equal deflections at 2000-lb. load. Mr. J. C. Reed, Steelton, Pa., explained his plans for bolting wood

tops to 16-ft. concrete butts in replacing a transmission line on which pressure cannot be removed more than two hours weekly. He estimated the cost of the composite pole to be less than either all-concrete or all-wood. Mr. T. E. Tynes reported his own costly experience with the dry-rotting of poles at the line where imbedded in concrete butts. Mr. C. W. Parkhurst spoke of the complex and difficult requirements imposed by railroads for transmission-line crossings, extending even to the chemical analysis of the steel, unit strength and provision for extreme wind and ice conditions. Mr. W. A. Worcester advised the use of heavy structures, since light sections soon rust. Mr. George Mann referred to difficulties in fastening cross-arms and steps to concrete poles and the fragility of the poles to chipping, breaking of corners, etc.

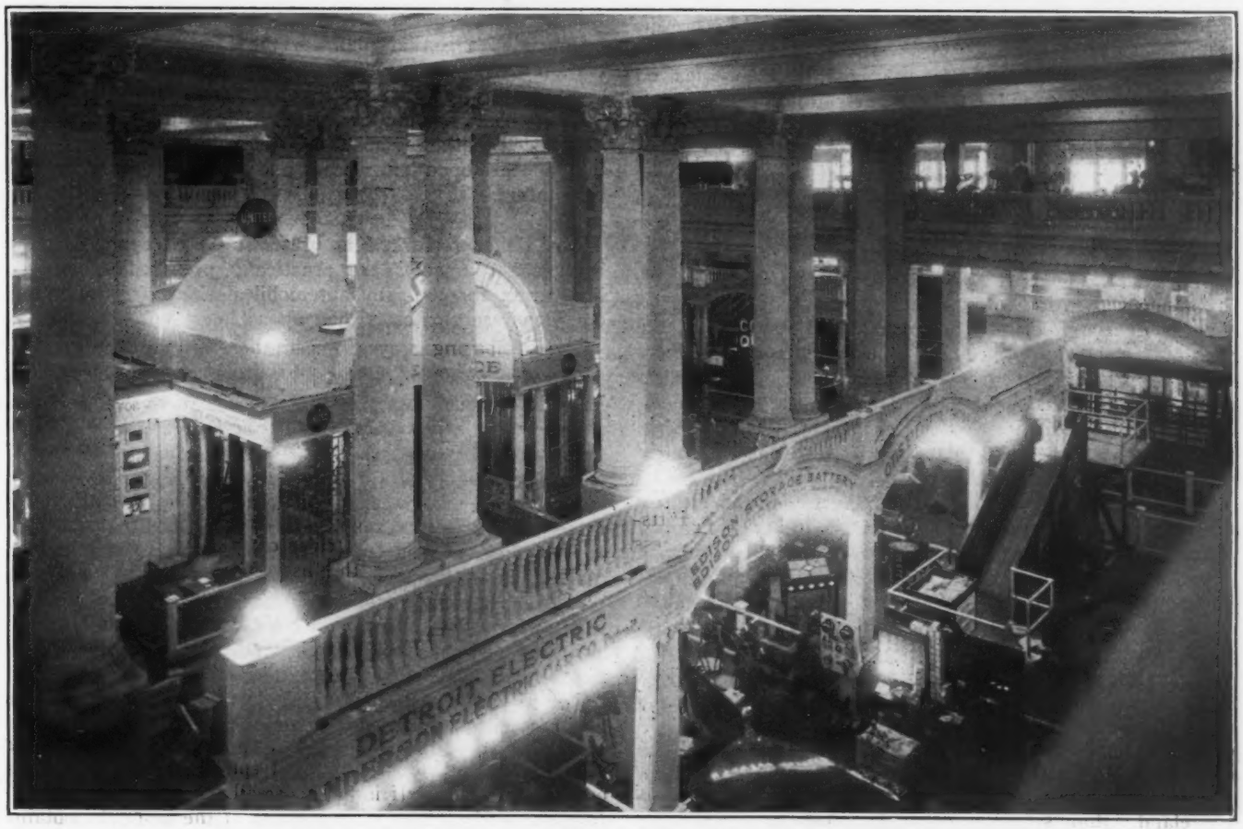
Owing to the pressure on our columns this week the remaining papers delivered before the association will be printed in abstract next week together with whatever discussion and comment their presentation called forth.

OPENING OF NEW YORK ELECTRICAL SHOW.

As we go to press the Electrical Exposition and the Automobile Show given annually in New York City opens its doors to the public. Like last year's exposition, the show this year is being held in the New Grand Central Palace on Lexington Avenue. The general arrangements are about the same, three floors of the immense structure being given over to the exhibits, but there is this year some of the great work on the Barge Canal now nearing completion.

The exposition itself was opened with a luncheon to Mr. Thomas A. Edison, given by the New York Edison Company, on the afternoon of Oct. 9, in commemoration of the completion of thirty years of central-station service. Among the 350 guests attending the luncheon were many men best known in the electrical industry and many prominent in the industrial world. These assembled to pay tribute to the genius of Edison and such an array of well-known men of the industry has seldom been seen at one time in New York. As an appropriate prelude to the speech-making, an ode to Mr. Edison, composed by Mr. W. J. Lampton, was delivered. Mr. J. W. Lieb, Jr., as toastmaster, reviewed at some length the early history of the New York Edison Company, and the general trend of development since the establishment of the old Pearl Street station. Statistics were quoted to show the almost magical growth of the central-station industry within the last three decades and its incomprehensible monetary value. The impetus for all of this was attributed to Mr. Edison, who, strangely enough, insisted upon continuity and dependability of central-station service from the outset. A fitting response on behalf of the guest of honor was made by Mr. Samuel Insull, of the Commonwealth Edison Company of Chicago. After the luncheon, which was given on one of the upper floors of the New Grand Central Palace, the guests were afforded an opportunity to see the exhibits prior to the admission of the general public.

In the exhibition the central stations in and around New York are well represented. Unfortunately, as we go to press the exhibits of the various central-station companies are not entirely complete.



General View of New York Electrical Exposition and Automobile Show.

more of general public interest to hold the attention of the multitude besides the array of electrical apparatus and appliances intended for ordinary use. In this respect the United States Government has contributed much that is instructive, and New York State has also been mindful of the opportunity afforded to give its citizens an insight into

The government exhibits are scattered on the three floors. Experiments in the stimulation of plant growth by means of electricity have been carried on quite extensively, and in a miniature greenhouse on the third floor

are shown flowers being subjected to high-tension currents. Contrasting with the flowers thus affected is a bed growing under normal conditions. Through the courtesy of the Navy Department, a naval electrical exhibit operated by the electric class at the Brooklyn Navy Yard is on view. The exhibit comprises a fully equipped wireless station, models of war ships and standard electrical fittings for marine use. The Army Signal Corps, War Department, the Bureau of Mines, the National Museum, the Bureau of Census and the Department of the Interior each demonstrate their several electrical activities. A large operative model of the Gatun dam, locks and spillways is contributed by the Isthmian Commission and an illustration of the use of electricity on the Mohawk River Dam at Yosts, N. Y., is furnished by the State Engineer at Albany, N. Y.

There is a large array of electric automobiles for pleasure and commercial use on view, and, needless to state, numerous electrical household conveniences are to be seen on all sides. The exposition closes on Oct. 19.

ANNUAL CONVENTION OF ELECTRIC VEHICLE ASSOCIATION OF AMERICA.

The third annual convention of the Electric Vehicle Association of America was called to order at Paul Revere Hall, Mechanics' Building, Boston, Mass., on Tuesday morning, Oct. 8, by President W. H. Blood, Jr., about 100 members and guests being present. Interest in the convention was enhanced by the holding of meetings in the same building which houses the Boston 1912 Electric Show, members and guests in attendance being welcomed freely to all departments of the latter upon presentation of badges. The program included two sessions on Tuesday and two on Wednesday, with automobile and country club trips on Tuesday afternoon and a theater party following adjournment Wednesday. Many of the delegates were taken to the historic points of interest in Greater Boston, Lexington and Concord, and the varied autumnal scenery of New England, combined with fine weather, contributed much to the enjoyment of those in attendance.

PRESIDENT'S ADDRESS.

Mr. W. H. Blood, Jr., of Boston, in his presidential address called attention to the splendid growth of the association in its short life of two years, and stated that the present membership represents companies having a combined capital account of over $500,000,000. The success of the movement has been almost entirely the result of co-operation. Larger sales of electrics have lowered overhead charges in manufacturing plants and reductions in electric rates have followed in the central-station systems. The public is the ultimate gainer from the use of the electric vehicle. The price of gasoline, on the other hand, has risen from 10 cents to a maximum of 25 cents per gallon in some localities, with a recent discussion among New York garage owners of a possible price of 30 cents. President Blood emphasized the reliability of the electric vehicle, its freedom from evils associated with the horse, and predicted the replacement in the near future of all city dray horses by motor trucks. Operating data show that electric vehicles are in service more days in a year than any other transportation device. In closing, the speaker commended the work of the various officers and committees and paid a high tribute to the co-operation of the technical press in the work of the association. He recommended the employment of a permanent secretary and spoke in terms of congratulation regarding the growth in membership and the adoption of a standard charging plug.

In presenting his address, Mr. Blood referred appreciatively to a recent traffic census by the Massachusetts Highway Commission, which shows that only about half the number of light horse-drawn vehicles of three or four years ago pass a given point, and that on an observed roadway, at least one automobile truck passed for every two-horse team.

PAPERS.

The committee on papers, Mr. Frank W. Smith, chairman, reported that seven monthly meetings of the association had been held at New York in the past year, one paper being presented and discussed at each. The average attendance was about 150. The committee favors the continuation of the policy of treating a single subject at a meeting, with one or two evenings for topical discussions by authorities. Attention was called to the electric vehicle research work being carried on at the Massachusetts Institute of Technology as a possible source of material for presentation at meetings.

MEMBERSHIP.

Mr. Frank J. Stone as chairman of the membership committee reported a total membership of 317 compared with 197 a year ago. Two hundred and twenty-eight members are located in the Atlantic Slope and Gulf States, including nine electric vehicle manufacturers and thirty-four central stations; seventy-two members are in the Middle States, including eight manufacturers and thirteen central stations; and seventeen are situated west of the Mississippi, including nine central stations. The association now has active branches in New England and Chicago. The committee recommends the engagement of a permanent secretary, the expense to be met from the advertising revenue of an official organ.

In the course of his report Mr. Stone announced that the association has at present secured 337 members, or a total gain of 71 per cent over a year ago. He referred to the success of the New England Street Railway Club in maintaining offices and a permanent secretary in Boston, and commended a similar plan for the Electric Vehicle Association.

ASSOCIATION EMBLEM.

The emblem committee, Mr. Arthur Williams, chairman, announced that an association emblem has been selected. It now appears upon letter-heads and lapel buttons used at the convention.

INSURANCE.

Mr. Baker remarked in presenting the report that the insurance companies are practically prepared to offer a lower rate for company automobiles which are not in the emergency service class than upon "hurry-up" wagons.

THE MODERN ELECTRIC VEHICLE.

In a paper entitled "Where We Stand To-day" Mr. C. E. Michel vigorously asserted that the day of apology for the electric vehicle has passed, and that it is no more a compromise than is a gasoline truck, a freight hauling steam engine or a transatlantic merchandise carrier. The field of application is just as clearly defined as is the field of the foregoing transportation units. The problem of mileage has been solved and the central station has come to the realization of the value of the vehicle battery load, its beneficent influence upon production; the public has come to appreciate the necessity for the car and the manufacturer has developed and improved his product to meet a condition exactly as have the steam engineer and the ship builder. Taken as a whole, the electric vehicle manufacturers are in better condition financially to-day than are their brothers in the gasoline car industry.

A strong plea was made in the paper against accepting horse traction as a result of inherited habit. Said the author: "What excuse could you give for the slowing down of a delivery system when it is acknowledged that the work that can be accomplished is a rough function of the speed of the delivery unit; for the actual increasing of costs of 25 to 40 per cent for at least 80 per cent of the concerns delivering merchandise in cities; for the many collateral forms of expense that are almost entirely absent in the case of the electric vehicle; and for the limitations of the animal itself and the dirt attendant upon its use? Even through

some very questionable mental gymnastics you could justify the animal, it is fairly certain that the police department, acting under orders from the Board of Health, would run you off the street. When reduced to cold facts, this is the actual competition we have to overcome, and sooner or later it is bound to fall flat."

In closing, the author emphasized the enormous field for the electric truck, the burden upon the manufacturer in educating the public as to what can be done by his products, and the recent rapid growth of the industry. Thus in St. Louis there has been an increase in charging revenue during the first half of 1912 at the rate of $1,000 per month, or nearly 37 per cent over 1911; it is estimated that in New York the number of electric vehicles increased 35 per cent in the year ending June, 1912, and in Chicago during that month there were 200 electric commercial vehicles under order and undelivered. One electric truck dealer, during 1911, sold single-handed, trucks to the value of $981,000, and not an apology was made for a single one. The field is broad and only the surface has been scratched.

Discussion.

Mr. G. H. Jones, Commonwealth Edison Company, Chicago, emphasized the rapid growth of electric vehicle applications, pointing out that in two years the number of electric trucks in Chicago has increased from eighty-one to 400. The company's largest garage, built about eight years ago, is about to be transferred to a new establishment capable of caring for 300 commercial and pleasure vehicles at one time. The extensive use of electric trucks by the large express companies and great mercantile establishments has done much to put the business on a solid foundation.

STREET CONDITIONS AND THE ELECTRIC VEHICLE.

In a paper by Mr. R. McAllister Lloyd emphasis was placed on the need of improved streets and roads for all kinds of automobile traffic, the author contending that as a rule the highways are not being constructed on good enough foundations or being systematically and properly maintained. The cost of motor vehicle maintenance would be largely reduced if Belgian blocks could be eliminated, holes in asphalt filled, proper rails used for trolley tracks and rails maintained flush with the street surface. The enormous waste of money in the replacement of worn-out and broken parts of motor-trucks enters into the cost of all commodities and here is an opportunity for the association to co-operate with public welfare organizations in securing better highway conditions. The paper closed with a plea for holding to the present speeds of electric trucks in the interests of safe operation under conditions of heavy traffic.

Discussion.

Mr. W. P. Kennedy, New York, urged that the association co-operate with organizations trying to secure better street conditions and criticised the expenditure of large sums of money by state organizations upon highway construction almost entirely outside of cities. He contended that horse-drawn vehicles do not pay a proper tax or bear their fair cost of road maintenance work. Even where such taxes are collected on a wheel basis much of the money appears to be diverted from road maintenance in municipalities. Mr. Day Baker, Boston, called attention to the recent attempts of the Massachusetts Highway Commission to limit the weight on motor truck tires and the speed of machines. The board desires to enforce a maximum of 1000 lb. per inch width of tire, but on account of the absence of adequate engineering data the Legislature of 1912 refused to sustain the commission in this position. An attempt will be made in the coming session to carry this recommendation through, and the matter deserves the consideration of both gasoline and electric truck users. Motor ways are now being considered by the street commissioner of Boston at the initiative of the motor truck interests of the city. Mr. Baker said in closing that a law should be passed making it a misdemeanor to deposit glass upon highways. Dr. Harold Pender, Boston, suggested that an investigation should be undertaken under the auspices of the association of the best types of road surfaces for motor-vehicle traffic, with thorough tests of the suitability of different highway constructions. Mr. E. W. Curtis, Jr., New York, concurred with Mr. Kennedy in regard to the need of applying more funds to the maintenance of city streets, and also emphasized the importance of parking spaces for electric vehicles in down-town districts. Other speakers were Messrs. W. W. Scott, Pawtucket, R. I.; R. M. Lloyd and E. C. Kavanaugh.

THE ELECTRIC VEHICLE IN DENVER.

This paper, by Dr. M. Ekstromer, reviewed the advantages of Denver as a field for the electric vehicle, emphasizing the favorable topography and climate of the city, the excellent street system and absence of heavy grades. The Denver Gas & Electric Light Company's rates to private garages on the off-peak basis are $5 minimum monthly charge plus 4 cents per kw-hr. over and above the minimum, with a 10 per cent discount. Peak charging raises the minimum to $7.50 per month. For public garages the rates are about 3 cents, with discounts based upon quantity.

Early in 1910 the company established a department of electric-vehicle and storage-battery engineering, which has since done much to standardize garage practice, educate users in the proper care of equipment, assemble and utilize cost data and promote co-operation among dealers. The company sells no vehicles directly and maintains impartiality between the competitive makes in its territory. An attractive monthly publication is mailed free to all owners of pleasure and commercial electric cars and also to merchants owning and operating gasoline or horse-drawn vehicles and trucks. The majority of charging garages in Denver cater exclusively to the electric clientele, and the private garages are models of neatness and efficiency. In June, 1910, there were three commercial and 480 electric pleasure vehicles in the city, which now has fifty-seven commercial electric vehicles in service or on order and 850 pleasure vehicles of the electric type in service. The vehicle load calls for 2,160,000 kw-hr., yielding a revenue of about $64,800 per year. Repeat orders are coming in, and the estimated increase in the next two years is 300 per cent. Denver now has one electric pleasure car for every 217 persons, or more per capita than any other city of its size in the country.

PUBLICITY.

The report of the publicity committee with Mr. C. L. Edgar, Boston, as chairman, and Mr. Frank W. Smith as chairman of the sub-committee, was presented with lantern slides showing the plan and detailed handling of the advertising campaign now being carried forward by the association, and demonstrating in a striking way the value of systematic work in the exploitation of the electric vehicle. Special credit was given to the Electric Storage Battery Company and other manufacturers for the inception of the campaign, which marks the expenditure of about $38,000 in seven groups of periodicals, calling for 432 insertions in publications having a combined circulation of nearly 3,600,000 copies. The campaign has been under way since May, 1912, and advertisements featuring the value of the electric vehicle as a general proposition have been published in general magazines, fashion and social periodicals, central station, auto trade and physicians' journals, and also organs appealing to the coal, wool, cotton, brewing, brick, iron, cement, teaming and department store trades. The general policy has been the criticism of the horse and the indication of its being the passing victim of an age of higher efficiency, whose elimination is demanded by present-day economy and

sanitation. The total number of readers of the forty-two trade journals and publications employed is estimated at 14,000,000. The association had received 702 inquiries regarding the electric vehicle up to the printing of the report. In conclusion the committee recommended that the association continue the campaign for another year; that the committee be enlarged to solicit subscriptions, care for publicity work and pursue inquiries of prospective customers; and that immediate steps be taken to secure subscriptions for the coming months' publicity work along educational lines.

Discussion.

Mr. H. S. Knowlton, Boston, commended the thoroughness of the analysis made by the committee and urged that the advertising in technical journals be maintained as well as that in popular periodicals. Messrs. E. S. Mansfield, Day Baker, T. H. Schoepf, E. C. Kavanaugh, C. D. Marsh and W. D. McJunkin participated in a vigorous discussion of the report, in which varied opinions were advanced as to the fitness of different types of mediums for publicity. The plan of continuing the campaign appeared to receive general favor. The last speaker cited other national publicity campaigns, notably that of the Bell telephone interests, and urged the benefits of co-operative advertising along unified lines.

THE COST OF MOTOR TRUCKING.

Dr. Harold Pender and Mr. H. F. Thomson, of the electrical engineering department of the Massachusetts Institute of Technology, presented a thirty-six-page paper upon the cost of motor trucking, with extensive data in tables and curves. The work has been done under an appropriation by the Edison Electric Illuminating Company of Boston and is the second publication of data by the department. The authors pointed out the difficulties of estimating the cost of operation of electric trucks under specific conditions and emphasized the influence of improved designs and operating methods upon costs.

In addition to the data upon the class of service, nature of roads and grades, there is given in the tables data upon the number of trucks represented in the report, their age, length of time covered, mileage and days of use of the equipment. The authors contributed an extended discussion of the desirable methods of estimating the cost of tires, repairs, battery renewals, energy for charging, fuel for gasoline trucks, lubricants, garage expenses, wages of driver and helper, interest, depreciation administration and insurance.

PROGRESS OF ELECTRIC TRUCKS.

The progress of electric trucks in America was discussed in a paper by Mr. E. S. Foljambe, who reviewed the increase in the use of commercial motor vehicles from 2500 in 1908 to over 30,000 at present, including both gasoline and electric machines, with a brief history of the industry. The production of commercial cars of both types in 1913 will probably add 40,000 new units to the motor transportation service of the country, so vast are the preparations made to handle the business. On account of the disinclination of electric vehicle makers to give out figures it is practically impossible to ascertain the exact number manufactured, but estimates place the number of electric trucks now in use at between 7000 and 8000.

The author contended that no greater mistake can be made than to compare continually or extol the advantages of gasoline and electric vehicles as against one another and took the ground that the displacement of the horse is the great work ahead rather than the triumph of either type of motor-truck. To-day the electric vehicle makers are coming to the front in the advertising field. The freedom of the electric from sunstroke, effects of cold, etc., has endeared it to many a business man, particularly during such torrid weather as occurred in the summer of 1911, when over 50,000 horses valued at about $11,000,000, succumbed during sixty days. Touching upon the improvements in batteries and vehicle design and construction the paper emphasized the excellent life characteristics of such machines and reviewed the advantages of low depreciation, increased mileage per charge, overtime capacity, low insurance rates, occupancy of one-quarter the stable room of the equivalent in horses and wagons, reduced maintenance through strict limitation of speed, ability to supplement horses in mixed installations and off-peak charging features which distinguish the electric truck. A large number of applications were outlined and tables of data quoted from the first bulletin of the electric vehicle research division of the Electrical Engineering Department of the Massachusetts Institute of Technology, Boston. In the brewing establishment of Peter Doelger, New York, the cost of delivery per barrel has been reduced 27 per cent by electric trucks compared with horses, the saving being $800 per year per truck. One 7-ton truck with two side chutes is furnishing all the coal used at the Hudson & Manhattan Terminal, in New York, and is doing more work than four three-horse teams. The ease with which electric trucks can be fitted with winches for transferring loads to buildings, upper windows, etc., is a point of importance. A tilting body truck with an electric winch in the service of Henry Disston & Sons, Inc., Philadelphia, for hauling material around the plant yard has displaced four horses, two wagons, eight men and one hand car. Freight car shifters in factory yards and small electric trucks for general industrial service are noteworthy recent applications.

These papers were briefly discussed by Messrs. H. F. Thomson, E. W. Curtis, Jr., and W. W. Scott, stress being laid upon the desirability of separating labor from material charges in analyzing operating costs.

POSSIBILITIES OF THE ELECTRIC VEHICLE.

Mr. S. G. Thompson presented a paper in which the future of the electric vehicle was forecasted from the rapid progress made in the past as compared with the rate of application of gasoline trucks. The ratio of increase of electric machines has quite closely adhered to the predictions of a year ago. The author contended that the future of the electric truck lies in the large city, since it is preeminent under conditions of traffic congestion. In New Jersey at the moment an overwhelming percentage of those now evincing interest in the electric wagon are the present gasoline machine operators, a fact that indicates market economic limitations in the latter type of machines. In twenty months the number of electric commercial cars in use in the country has increased from a mere handful to a quantity exceeding 20 per cent of the total number of commercial motor vehicles of all sorts now in service. In closing the author presented the following reasons for the assured future of the electric commercial vehicle: that with a few exceptions, all the largest motor wagon installations in the country are of electric vehicles; that the "fleet" orders have been placed by concerns experienced in its handling of motor wagons; that in one electric installation are more commercial wagons than the total number of all types represented in thirty-one states; that the combined electric vehicle equipments of only fifty operators represent 10 per cent of the total motor wagon service of the country; that one prominent express company depends almost entirely upon electric machines for its delivery service in eleven of the principal cities of the United States, and that despite the pessimists, all this has been accomplished by less than ten active electric vehicle makers in the face of aggressive competition of nearly 300 makes of gasoline machines.

Discussion.

Supplementing his paper, Mr. Thompson emphasized the prestige which association with a central-station organization gives the electric vehicle sales engineer and spoke of the favorable results gained from the weekly circular letters on the electric vehicle issued by the Public Service Cor-

poration of New Jersey and sent to a selected mailing list of about 2000 concerns interested in electric truck development. Mr. J. E. Hale, Akron, Ohio, called attention to the increasing value of the industrial electric truck, but urged thorough investigation of conditions before recommending its application in specific cases. Unless the speed can be utilized beyond that possible with the hand truck, or unless the capacity can be augmented, it is questionable whether the industrial truck should be installed. In most cases there are no serious obstructions to the movement of the industrial truck, so that its full economies can be secured if the speed conditions can be met. President Blood urged electric vehicle manufacturers to make all necessary plans for raising the capital which will certainly be required in the near future to meet the demand of the public for electric trucks and pleasure cars, warning the convention that if this is not done serious competition will come from gasoline motor vehicle makers. Messrs. R. L. Lloyd, Philadelphia; E. W. Curtis, Jr., New York, and E. S. Mansfield also spoke briefly.

OPERATING RECORDS.

The committee on operating records of which Mr. J. T. Hutchings, Rochester, N. Y., is chairman, recommended the employment of a public accountant and the working out of a complete system of operating records after visits to important cities. The committee recommended the following subdivision of charges and expenses prior to the carrying out of the foregoing plan: Operating charges, including lubricants, electricity, battery renewals, tire renewals, repair material, repair labor and painting; fixed charges, including garage general expense, garage labor, sundries, driver, helper; overhead charges, including amortization, interest, fire insurance, liability insurance, and administration. Battery, tire and performance records should be kept in complete form.

RATES AND CHARGING STATIONS.

Through its chairman, Mr. John F. Gilchrist, Chicago, the committee on rates and charging stations submitted a report favoring the wider use of the public garage, lower maximum prices for energy, separating the energy charge from the garage charge, and the use of a uniform sign for garage service. The electric vehicle is more closely approaching the service of a touring car and there is great need of a more general awakening to its importance by central stations. In cities of the first magnitude, $5,000,000 to $15,000,000 per year for electric charging when the electric vehicle has completely displaced the horse, is a conservative estimate, and smaller cities should reap a proportional benefit. Greater co-operation is desirable between the central station and the heavily burdened manufacturer. Representative garage signs were shown by the committee.

Upon motion of Mr. E. S. Mansfield, Boston, it was voted to recommend the separation of housing and energy charges in commercial garages. Mr. G. H. Jones, Chicago, stated that to meet the requirements of truck owners who find the reading of meters burdensome before and after charging, a new form of meter has been developed for the Commonwealth Edison Company. The apparatus is provided with means for setting the pointer on one dial back to zero at the beginning of each charge, and a direct reading in kilowatt-hours is secured. Where the vehicle user does not wish to invest in meters the company supplies him and maintains the meter at a price of 50 cents per month, which just about covers the expense, including fixed charges. It was voted to give the executive committee full power to act upon the recommendation for a standard sign for electric garages, the association insignia to be included as a feature.

EDUCATION OF VEHICLE EMPLOYEES

The committee on education, through Mr. William Pancoast, chairman, emphasized the need of better training of garage and electric vehicle factory employees, and described the electric vehicle course lately inaugurated by the Technical High School, of Cleveland, Ohio. The endeavor will be to give both theoretical and practical instruction, and a prominent automobile factory is encouraging the work by giving the instructor in charge every opportunity to familiarize himself with factory conditions. It is expected that the training will do much to provide better garage employees, as well as material in some cases for electric vehicle salesmen. Before reaching that part of the course actually applying to electric vehicle practice the pupil will have a substantial groundwork of mathematics, English, drawing, industrial geography and shopwork. The actual study of electric vehicles includes the principles of every detail of equipment, assembly, location of troubles and adjustments, with elementary electricity.

Discussion.

Mr. Day Baker, Boston, cited the lecture work which he is conducting at the request of the Y. M. C. A. authorities at Boston upon the electric vehicle, for the benefit of each monthly graduating class in the automobile training school. Mr. C. Blizard, Philadelphia, stated that steps have also been taken to interest Y. M. C. A. directors in the electric vehicle in many other parts of the country.

STANDARDIZATION OF DETAILS.

The committee on standardization recommended making the shell of the charging plug of high carbon or case-hardened steel, and the adoption of the association plug as a standard in vehicle practice. It was also recommended to standardize the "Ediswan" bayonet socket for lighting and suggested that a maximum tractive effort be standardized for a given size of tire.

Following the presentation of this report it was voted that the association's standard charging plug be recommended for general use.

THE ELECTRIC VEHICLE FROM AN INSURANCE STANDPOINT.

The author, Mr. Carl H. Clark, explained the terms of the automobile fire policy, discussing the "valued" and "non-valued" forms. In the former the value of the automobile is agreed upon when the policy is written, so that there can be no question as to the amount payable in case of destruction. In the event of partial loss the "valued" form allows the replacement of damaged parts with new, without regard to depreciation. Damage during transportation by rail or water is allowed for, as are loss by theft in excess of $25 and damage in the hands of unauthorized persons. In the "non-valued" form, which costs less than the former, losses are adjusted on the basis of the value of the damaged parts at the time of the loss, including depreciation. An extension of the fire policy provides for any loss sustained from collision. Electric vehicle insurance rates at present average about half those for gasoline cars. The electric rate remains at a fixed percentage, that on the gasoline machine increasing with the age of the car. The rate on electric vehicles has lately been reduced, with the prospect of further reductions with improved conditions.

The author discussed the causes of electric-vehicle fires in the following general order of frequency: Overheating of resistor coils by accidental closing of the switch while the car is at rest; heat given off by resistor coils in ordinary use; short-circuits in wiring, caused by water or snow; chafing or bruising of insulation, and ignition while charging. The remedies from an insurance standpoint would be some means of practically compelling the withdrawal of the plug when leaving the car, a positive lock on the control lever when in the neutral position, resistors better ventilated and at a proper distance from woodwork, wires run in conduits or fiber tube, elimination of all loose and swinging wires, and charging without the presence of open flames. In closing, the author advised stamping the

machine number into the frame in a definite location to insure identification, not seldom lost by the removal or melting of a numbered brass plate.

Discussion.

Col. E. W. M. Bailey, Amesbury, Mass., urged co-operation with the insurance interests in vehicle design and construction. Mr. C. A. White, Boston, stated that the Edison company's cars are being rewired in accordance with the most approved practice. He cited the use of an electric-bell attachment to warn the operator in case the controller is left on the first notch with the brake set. Mr. S. G. Thompson, Newark, N. J., spoke briefly of the value of an extra locking brake which cannot be operated unless the current is off the machine. Mr. K. Bostell, Newport, R. I., also spoke briefly.

STANDARDIZATION OF VEHICLES.

In a paper entitled "Standardization of Electric Vehicles," Mr. Alex. Churchward, of the General Electric Company, recommended certain standard maximum speeds for electric vehicles, and presented a series of curves and data showing the influence of speed conditions upon the operating characteristics and particularly the energy consumption of cars under actual service. He recommended maximum speeds in miles per hour as follows: Closed coupes, 18 with solid and 19 with solid cushion tires; open victoria type, 20 and 19, respectively. The present speeds of commercial vehicles vary from 6.5 in 6-ton equipments to from 12 to 13 in the 1000-lb. units. The tests showed in great elaboration the benefits of moderate speed, which is all that is necessary to enable competition with the horse to be successful.

Following the reading of the paper the association voted to adopt the "Ediswan" or bayonet base for automobile incandescent lamps in place of the screw base, as recommended by the committee.

Mr. Jean Blaise, of the Peter Doelger Brewing Company, New York, was called upon at the Wednesday session as a user of electric trucks on a large scale, and stated that his company is about to build depots outside New York from which electric truck deliveries will be facilitated over a 25-mile radius from each depot. The company owns fifteen gasoline trucks of German make, but these, although of the best design, are out of service for repairs 30 per cent of the time. Within six years the company intends to do away with all its gasoline trucks and use only the electric type. The maintenance costs of the former are very high. The company has expended $350,000 in two years for electric trucks, and the entire change thus far made from horses to electric haulage will pay for itself in three years if the business grows at the present rate.

SECTION REPORTS.

The annual reports of the Chicago and New England branches of the association were respectively presented by Chairman George H. Jones and Secretary Welles E. Holmes. Both branches are in good condition and appear to have an assured future.

A moving-picture display of the electric vehicle parades in Boston on Memorial Day in the past two years was shown to the convention on Tuesday evening. On Wednesday noon a luncheon was given to the delegates and their guests by the Edison Electric Illuminating Company of Boston, Mass.

The following officers were elected for the ensuing year: President, Mr. Arthur Williams, New York Edison Company; vice-president, Mr. F. W. Smith, United Electric Light & Power Company, New York; secretary, Mr. Hervey Robinson, New York Edison Company; treasurer, Mr. Day Baker, General Vehicle Company, Boston; directors, Messrs. W. G. Bee, W. H. Blood, Jr., E. S. Mansfield, G. H. Kelley and P. D. Wagoner.

PUBLIC SERVICE COMMISSION NEWS.

NEW YORK COMMISSION.

The Public Service Commission, Second District, has given its permission for the transfer of the control of the Salmon River water power development to the Niagara, Lockport & Ontario Power Company. The authorization of the commission allows the Niagara company to hold all the capital stock of the Salmon River Power Company, formerly the Oswego County Light & Power Company, the total outstanding amount of stock being 7500 shares of the par value of $100 per share. The Niagara, Lockport & Ontario Power Company is authorized to issue its first preferred stock to the amount of $750,000 for the acquisition of the stock of the Salmon River Power Company. The Salmon River company is authorized to execute a mortgage upon all its property to secure its forty-year 5 per cent bonds to the amount of $5,000,000 and to issue $2,353,000 of bonds at the same price as permission was previously given the Oswego County Light & Power Company, viz., 85. The proceeds of the bonds are to be used for the construction of a dam, transmission line and the necessary apparatus and appliances for transmitting electricity. The Salmon River company is also authorized to lease all its franchises, works, system and property to the Niagara company at a rental equal to one and three-quarter times the interest on bonds. The bonds are also guaranteed by the Niagara company. A further account of the development plans of the Niagara, Lockport & Ontario Power Company appears elsewhere.

The commission is now distributing its fifth annual report, which covers the year ended Dec. 31, 1911. Vol. 1 contains the text of the report and the orders issued during the year. Vol. 2 contains the abstracts of reports of steam railroad, electric railroad, express and sleeping-car corporations, and the report of steam railroad inspections. Vol. 3, when it appears, will contain abstracts of reports of gas, electrical, telegraph and telephone corporations. Vol. 2 of the reports of the commission, which will be the second bound volume of the opinions rendered, is in preparation.

MASSACHUSETTS COMMISSION.

A petition for the establishment of a 5-cent fare for the Hyde Park section of Boston has been brought before the Railroad Commission by Representative David W. Murray. The board will be asked to hear the case on the ground that Hyde Park is the only section of Boston where a double fare exists, and that through consolidation and general agreement between companies it has become a general rule throughout the State that within the limits of a city or town there should be a 5-cent street-railway fare. The situation is complicated at Hyde Park by the operation of two connecting electric railway systems, the Bay State Railway and the Boston Elevated Railway Company. The latter is obliged by the terms of its charter to carry passengers in the same general direction upon its system for a single 5-cent fare, no reduction being required where the car of a foreign company is handled. It is probable that the present rates will be maintained unless arrangements are made for a lease of the Bay State trackage by the elevated company.

MARYLAND COMMISSION.

Mr. Victor G. Bloede, president of the Patapsco Electric Company of Maryland and Patapsco Electric Company of Delaware, testified last week before the Maryland Public Service Commission that the rates of both companies for electricity were 20 per cent lower than those of the Consolidated Gas, Electric Light & Power Company. This assertion was made in connection with a petition to merge the first two concerns. These companies supply thirty or forty customers in Baltimore, mainly along the Frederick Road, while the rest of their energy is used in Baltimore County, west of the city, and in Howard County and around

Ellicott City. The Maryland company has a fixed capital of $200,000 and the Delaware concern $225,000 of capital stock. There is also an indebtedness of $40,000, which is secured by notes of stockholders. The amount of new stock to be issued, if permission be accorded by the commission for the merger, is $425,000, retiring the old securities. Charles E. Phelps, electrical expert for the commission, appraised the properties at $345,623, without including certain water rights. The concerns have two water-power stations, one at Ilchester and the other at Grays Mills, and also a steam station. The area served is from two miles beyond Ellicott City to the city limits and from Ilchester to Rogney Heights, or, roughly, an area of 40 square miles. President Bloede said that only within the last two years have the companies made profits. Some small competition has been fought, which, Mr. Bloede said, is one reason for the cheap rates. Senator Arthur P. Gorman and Mr. Robert Biggs represented the companies at the hearing.

The Baltimore gas and electric rate investigation was brought to a close last week, and the counsel for the people and also for the Consolidated Gas, Electric Light & Power Company thanked the members of the commission for their patience and their attention during the several months of hearings on the question. The stenographic record of the investigation is probably the largest and most technical ever reported in the State of Maryland, containing 4819 pages of lengthy and complicated tabulations, testimony and arguments. There were forty-four hearings by the commission, and each lasted not less than four hours. Expert testimony was given by financiers, engineers, real estate brokers, accountants and statisticians.

OHIO COMMISSION.

Application has been filed with the commission for authority to consolidate the Bell and Independent telephone systems at Delaware. Some months ago the commission refused a similar application because of the loss to the Independent company of about $1,590 from the duplication of equipment. In this application nothing is included for loss in duplication, as the Bell company has agreed to retain all equipment on which there is duplication and dispose of it as may seem best. The purchase price of the Bell property is to be $10,576.17, and this company is to furnish the local company with long-distance service.

The commission is now making a very careful investigation of all telephone properties that are to be consolidated, in view of the fact that some of the larger companies are expected to make application for consolidation at no distant date.

WISCONSIN COMMISSION.

In order to enable the Racine Gas Light Company to acquire the properties of the Kenosha Gas & Electric Company and the Kenosha Electric Railway Company the Wisconsin commission has authorized the issue of $2,000,000 par value of 5 per cent bonds, $200,000 par value of 6 per cent cumulative preferred stock and $500,000 par value of common stock. Of this issue, stock and bonds to the amount of $1,308,000 are to be exchanged for the properties to be acquired; the remainder is to be used in repaying loans and in making future extensions to the property.

In the application for improved telephone service in the village of Altoona the commission has ordered the Wisconsin Telephone Company to install the necessary additional equipment and to furnish a higher grade of service, provided a majority of the subscribers signify their intention of using such service at the higher rates ordered by the commission.

The preliminary testimony has been taken in the complaint of the city of Waukesha against the Waukesha Gas & Electric Company. The city alleges that the rates for gas and electric service are excessive and that the service is inadequate.

CALIFORNIA COMMISSION.

The California Railroad Commission has granted the application of the Mt. Whitney Power & Electric Company to put into effect a new form of meter contract for motor service providing for a minimum of $24 per year.

The commission has set Oct. 16 for the hearing of the telephone induction cases. The Pacific Telephone & Telegraph Company filed four complaints, one against the Sierra & San Francisco Power Company, alleging interference with the lines in Santa Clara and Monterey Counties; one against the Coast Counties Gas & Electric Company, alleging interference in Santa Clara and Santa Cruz Counties, and two against the Great Western Power Company, alleging interference in the section north of San Francisco Bay. The telephone company requested that the power companies be compelled to move their high-tension wires from 700 ft. to 2000 ft. from the telephone lines.

The Great Western Power Company has applied for a certificate of public convenience and necessity to exercise franchise rights in the towns of Suisun, Fairfield and Dixon, and to sell electrical energy.

Current News and Notes

ELECTRICAL WIRING ORDINANCE IN DURANGO, COL.—It is reported that the City Council of Durango has instructed the city attorney to draw up an electrical ordinance which will substantially enforce the requirements of the National Electric Code. The grounding of transformer secondaries will also be mandatory.

* * *

SMOKE ABATEMENT DISCUSSION BY A. S. M. E.—A general discussion of the subject of smoke abatement will be conducted under the auspices of the American Society of Mechanical Engineers in New York on Oct. 8. The discussion will be opened by Mr. George H. Perkins, head of the engineering department of the Lowell Textile School, who attended the International Smoke Abatement Exhibition and Conference held in London in March as the representative of the A. S. M. E. and of the city of Lowell. The meeting will be preceded by an informal dinner arranged for by a local committee of the society.

* * *

UNIFICATION OF CHICAGO SURFACE STREET RAILWAYS URGED.—A resolution has been introduced in the local transportation committee of the City Council of Chicago directing the committee to take such action as may bring about, if possible, the merger of the two surface street railway companies operating in the city. It is recited that, although the companies operate in different sections of the city, there is duplication of service, difficulty in making through-route arrangements and inadequate service and misunderstandings at connecting points. The presidents of the two companies are asked to meet the committee and give their views before the resolution is adopted.

* * *

STEEL TONNAGE CONSUMED BY TRANSMISSION STRUCTURES.—The quantities of steel entering into the construction of some of the great transmission systems may prove surprising to those who underestimate the importance of tower structures. The Southern California Power Company has used to date 20,000 tons of steel-tower construction. For the 150-mile transmission from the Mississippi River development at Keokuk, Iowa, to St. Louis, 10,000 tons have been ordered. The Georgia Railway & Power Company's system comprises 5000 tons, and the Connecticut Power Company's lines 3000 tons. In comparison with these figures it is interesting to note that an average ten-story office building, occupying ground 80 ft. by 150 ft.,

requires about 1200 tons of steel, and that the large California system above cited contains enough to build a dozen steel-arch bridges like that spanning the gorge at Niagara.

* * *

Rate Research.—The new printed organ of the rate research committee of the N. E. L. A. made its appearance on Oct. 2. It is a pamphlet of 16 pages, and is an outgrowth of the weekly bulletin of the committee. It will be issued weekly, the subscription price being $10 a year or three copies to one address for $25. Mr. William J. Norton, 120 West Adams Street, Chicago, is the editor and manager of the publication.

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Errors in Water Supply Paper 295 of the United States Geological Survey.—The director of the United States Geological Survey states that a careful examination of Water Supply Paper 295, "Gazetteer of Surface Waters of California, Part I, Sacramento River Basin," has disclosed so many important errors that it is desirable to reprint the paper. The reprint has been ordered. A notice of the appearance of the original publication appeared in the *Electrical World* of Sept. 28, page 653.

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Regulations Governing Radio Communication.—Under date of Sept. 28 the Department of Commerce and Labor has addressed to all owners and operators of apparatus for radio communication a circular of instructions relating to the provisions of the act to regulate radio communication, which will take effect on Dec. 13. The regulations established by the act will be enforced by the Secretary of Commerce and Labor through collectors of customs and other officers of the Government. For the purpose of administration the department has divided the country into nine districts having principal offices at the custom houses in the following ports: Boston, New York, Baltimore, Savannah, New Orleans, San Francisco, Seattle, Cleveland and Chicago. The examination of operators for licenses, as prescribed in the regulations, will be held at the United States navy yards at Boston, Brooklyn, Philadelphia, Washington, Norfolk, Charleston, New Orleans, Mare Island and Puget Sound; the naval stations at Key West, San Juan and Honolulu; also the Naval Academy, Fort Sam Houston, Fort Wood, Fort Omaha, Fort Leavenworth, and the army stations at St. Michael and Fairbanks, Alaska, and at the Bureau of Standards. The circular covers the new regulations at considerable length, describing the several classes and the different grades of operators. An abstract of the new law appeared in the *Elcctrical World* of Aug. 24, page 388.

* * *

Investigation of Pittsburgh Smoke Nuisance.—Bulletin No. 1, issued by the Department of Industrial Research of the University of Pittsburgh, under date of August, 1912, is devoted to an outline of the investigation of the smoke nuisance in the Pittsburgh district. The expert staff in charge of the smoke-nuisance investigation is unusually large and comprehensive, including two chemists, one attorney, four engineers, seven physicians, one botanist, five architects, one bacteriologist, two economists, one meteorologist, one physicist, one bibliographer, one surgeon and a secretary. At the present time the investigation is being carried on by this staff of specialists, six of whom are giving their entire attention to the work. A prominent Pittsburgh business man in 1911 donated a fund for this undertaking. The investigation as a whole has been separated into two broad divisions, the analytical or diagnostic portion, and the constructive or remedial measures. Among the numerous phases of the problem which are receiving attention are the effect of smoke upon vegetation, the chemistry of smoke and soot, the physical problems of smoke, deterioration of buildings and building materials, relation of smoke to disease, the cost of the smoke nuisance and the legal aspects of its prevention. Dr. Robert Kennedy Duncan is director of the Department of Industrial Research.

* * *

Reasons for Considering Steam Drive for New Mill at Gary.—Much interest has been aroused by the report that the Indiana Steel Company is considering steam-engine drive for the rolls of its new slab mill at the Gary, Ind., plant. By some this action has been taken as evidence that the extensive equipment of electric motors in the Gary mills has proved unsatisfactory and that the proposed steam drive represents a return to early practice. The real reason for considering engines in this particular case, however, rests on the economic fact that it will be possible to place boilers in the flues of the reheating furnaces required for the slab mill, thus saving heat otherwise wasted and making available large quantities of steam at small expense. The main-roll engines would utilize this steam, thus contributing to the by-product efficiency of plant operation, without additional power-house equipment. Under such special conditions, of course, no reflection could be implied upon electrical operation, and in fact, even here, despite the manifest economies of engine drive above pointed out, electric power is being considered as an alternative to the proposal to use steam. Very careful study is, of course, being given to the choice of driving equipment, as the new slab mill will be one of the largest ever built.

* * *

SOCIETY MEETINGS.

Radio Engineers.—At the regular monthly meeting of the Institute of Radio Engineers, held on Oct. 2, 1912, a paper was presented by Dr. Alfred N. Goldsmith on "Present Educational Necessities in Radio Communication," in which emphasis was laid on the fact that Germany is, and has been for some time, far in advance of all other nations in scientific radio education and consequent development. Dr. Goldsmith stated that, with the exception of a part-year course in connection with the electrical engineering course at the Ohio State University, apparently no progress had been made in America in this direction until the present time. The College of the City of New York has now established a course in radio communication, in charge of Dr. Goldsmith, the object of which is to develop scientific radio engineers, no instructions to be given in operating. The course will cover a period of forty weeks, or 240 hours, 200 of which are to be spent in laboratory work, and will take up in succession mechanical vibrating and electrical systems and include numerous lectures and much experimental work. With the addition of a complete Poulson telephone-telegraph set, the money for which was furnished by Mr. Gano Dunn, the college possesses adequate equipment for quite extensive instructions. The standardization committee of the institute, composed of Messrs. J. L. Hogan, A. N. Goldsmith and R. H. Marriott, reported satisfactory progress in the work of standardization. The next meeting of the Radio Institute will be held at Fayerwether Hall, Columbia University, on Nov. 6.

* * *

Los Angeles Section, A. I. E. E.—The first meeting of the Los Angeles Section of the American Institute of Electrical Engineers after the summer recess, was held on the evening of Sept. 24. Over 100 members and associates gathered at Brink's Cabaret for what was designated as a "Who's Your Neighbor?" meeting. Mr. George A. Damon, the newly elected chairman, was in charge, and Mr. E. R. Northmore, re-elected secretary, assisted. Each one of those present was asked to tell his name, family history, and future prospects. Everybody responded, and jollity ruled supreme. Several instructive short-talks were made, some of which were aptly supplemented with views on the screen. If the winter technical meetings are as well attended and as enthusiastic as the first one, the season will be very successful.

THE JORDAN RIVER POWER DEVELOPMENT.

Description of Hydraulic, Generating and Transmission Features of the Vancouver Island Power Company's Plant.

Extraordinary Difficulties Encountered in Practically Unknown Regions of British Columbia—Average Rainfall of 80 Inches the Heaviest in the Northern Part of the Continent—Construction of Reservoirs with a Total Capacity of 1,500,000,000 Cu. Ft.

WESTERN Canada, particularly the southern coast districts of British Columbia adjacent to the cities of Vancouver and Victoria, is growing with such rapidity that in these communities it has been for some time a serious problem with the public-utility companies to keep pace with the rapidly increasing demand for service.

The British Columbia Electric Railway Company, Ltd., owning and operating the traction, lighting and power systems of Vancouver and Victoria and territories adjacent thereto, has been for the past five years laboring with this problem. The growth and expansion of the districts which this company is serving have been phenomenal, and the demand for electricity has been multiplied several times within that period. The steam and water-power equipment of the British Columbia Electric Railway Company's plants has been increased constantly and generally in time to anticipate requirements.

As early as 1907 it was realized that material increase in generating equipment would be required by the Victoria branch, but that this could be met within a period allowing adequate investigation of the available water-power resources on the southern end of Vancouver Island and the installation of a modern, well-equipped hydroelectric station.

At the time the Jordan River development was actually begun the British Columbia Electric Railway Company was serving Victoria and adjacent territory with electricity from an 800-kw steam station in Victoria and a 2000-kw hydroelectric station at Goldstream, about 10 miles out of the city. The latter plant was operated with surplus water purchased from the Esquimalt Water Company and could run at full load only during a part of the year on account of water shortage.

PRELIMINARY WORK.

Mr. Wynn Meredith, then consulting engineer for the British Columbia Electric Railway Company, was authorized to look into the available power possibilities, and under his direction an exhaustive series of investigations were carried out, which included practically all the sources of water-power within a radius of commercially feasible transmission to the city of Victoria. This preliminary work was continued for upward of a year and was accomplished under the most extraordinary difficulties, the investigation in many cases being more properly exploration of an unmapped and practically unknown region, untraversed, except for a narrow fringe of coast line, beyond the occasional visit of trapper or timber cruiser. Pioneer work in the forests of British Columbia can be properly appreciated only by those who have undertaken it. Water-powers are abundant, but the wild, rugged and inaccessible character of the country renders it difficult in the extreme to acquire even very limited preliminary knowledge of a possible water-power development. Most of the virgin country is covered with

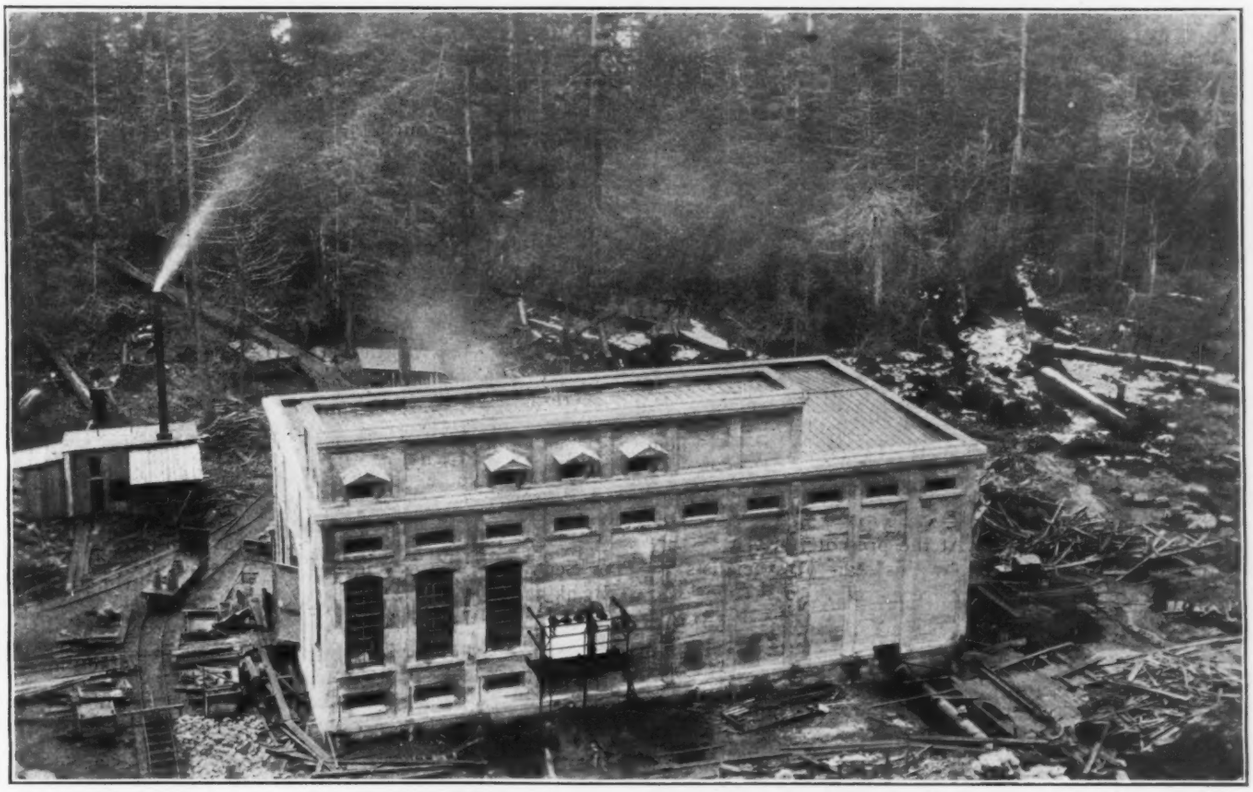


Fig. 1—Rear of Power House, Jordan River Development.

heavy timber, and whether timbered or not the ground is covered with a dense growth of brush and fallen and rotting trees.

The hardships endured by the engineers on reconnoissance work, their heart-breaking conquest of the jungles, struggling with pack on back through the proverbial "impenetrable" British Columbia forest, blazing many paths in order to insure safe retreat in case further advance was impossible or to retrace the course if promising conditions were discovered, have become a part of the history of the "job," and to the perseverance and hardihood of these pioneers the successful culmination of the investigation is largely due.

An examination of the upper watershed of the Koksilah River in the latter part of 1907 led to the first consideration of a possible power development on the Jordan River, the headwaters of which lie adjacent to and separated by only a few hundred yards from the source of the Koksilah. A visit to the mouth of the Jordan on the west coast of the island a few weeks later disclosed a large and rapid stream, further exploration of which was prevented at the time by the absence of trails and the prevailing wet season, which renders pioneer work in this country almost impossible. A gaging station was, however, established near the mouth of the stream and a series of observations of the run-off were instituted.

Early in the spring of 1908 a party of engineers was engaged to explore thoroughly the river and all its branches, investigate the possible reservoir sites and ascertain in a preliminary way the head or fall obtainable. This information was gathered during the summer, and in November, 1908, Mr. Meredith, who had in the meantime entered the firm of Sanderson & Porter, engineers, of New York, made a formal report on the project, having determined that the watershed with the run-off observed and the use of certain storage reservoirs which had been discovered would, with the head available, amply warrant development for power purposes. Messrs. Sanderson & Porter were then retained by the British Columbia Electric Railway Company, Ltd., to design and construct the Jordan River system. A subsidiary corporation, known as the Vancouver Island Power Company, Ltd., was formed under the auspices of the British Columbia Electric Railway Company to finance and otherwise assume charge of the project.

JORDAN RIVER.

The Jordan River flows into the Straits of Juan de Fuca at a point about 40 miles west of the city of Victoria. It is one of the large streams on Vancouver Island, the drainage area being about 75 sq. miles, the greater part of which lies above an elevation of 1200 ft. The source of the main river is at Jordan Meadows, which lie about midway between the east and west coasts of the island at an elevation about 1700 ft. above sea level. Three large tributary streams join the main river in the upper 10 miles of its course, Bear Creek and Alligator Creek from the east and "Y" Creek from the west, forming a high-level watershed, the entire run-off from which is available for power purposes. The entire watershed is covered with a very heavy growth of timber and at the higher levels receives each year a covering of snow from 4 ft. to 7 ft. in depth, which is gradually melted in the spring, but does not, as a rule, entirely disappear until June or July.

British Columbia is noted for excessive precipitation and great changes in amount of precipitation in short distances. On the mainland near Vancouver an annual precipitation of 160 in. has been observed, and a variation of 100 per cent in annual precipitation has been noted in the same season at points only a few miles apart. The average precipitation over the entire Jordan River watershed, as shown by observations extending over a period of four years, is about 80 in.

The development has the usual features of storage reservoirs, diverting dams, flumes, forebay reservoir, pressure pipes, power house, transmission line and substation, but the extraordinary conditions under which the work was accomplished, the development of special methods of meeting these abnormal conditions and the details of the execution possess more than passing interest.

The Jordan River has a wide variation between summer and winter flow. The highest portion of its watershed is not more than 2700 ft. in elevation. The area possesses features especially calculated to conserve the precipitated waters, more particularly in the dense jungle of forest and underbrush with which it is clothed, the mat of forest floor from 1 ft. to 2 ft. in depth overlying the soil, the retarded melting of the snow due to the dense shade of the forest, and the moderate transverse slope of the mountain sides. All of these features, however, do not prevent a period of extremely low water for from sixty to ninety days in the summer and fall of each year. The stream flow has been systematically observed since 1907, and the results obtained more than sustain the findings of the original report in which the maximum power production of the watershed, based on a 50 per cent load-factor, was placed at 24,000 hp, with the commercially feasible storage available.

It was seen at the beginning of the investigation that a large storage capacity would be required to impound flood waters for use during the dry season. Five favorable reservoir sites were found in the flats and meadows along the upper reaches of the river and its branches. The capacities of these storage basins and the sizes of the impounding dams required have been determined, and the results show that ample storage capacity is available, within reasonable cost, to provide for an ultimate maximum plant output of 24,000 hp to 36,000 hp. The capacity of these reservoir sites is given in the accompanying table. One impounding dam is now complete at Bear Creek Reservoir, and the other storage sites can be developed as additional generating units are installed to meet the increasing power requirements.

TABLE I.—HEIGHT OF DAM AND CAPACITY OF PROJECTED RESERVOIRS.

Sites.	Height of Dam, Ft.	Capacity, Cubic Ft.
Bear Creek (initial development)	55	320,000,000
Bear Creek (ultimate development)	75	608,000,000
Alligator Creek	35	95,000,000
"Y" Creek	35	110,000,000
Jordan Meadows	35	179,000,000
Diversion storage	85	250,000,000

BEAR CREEK RESERVOIR.

This reservoir site lies near the headwaters of Bear Creek, the dam being about a mile above the junction of that stream with Jordan River, about 4½ miles by wagon road from the diverting dam and some 13 miles from the power station at the beach.

The impounding basin is formed in the long and comparatively narrow valley of Bear Creek, through which the stream winds in a succession of sluggish pools for a distance of some 2 miles above the site of the dam. The sloping sides of the valley are chiefly of broken and partly metamorphosed slate, covered with soil to a depth of from 3 ft. to 6 ft. As the flat bottom of the valley is approached, the bedrock dips gradually from either side toward the center of the valley and is topped with a layer of hardpan—a semi-cemented glacial gravel mixed with clay. This attains a depth of 87 ft. in the ancient bedrock channel, which at the dam site is some 300 ft. north of the present stream bed. The entire reservoir area supports a heavy growth of fir, spruce, hemlock, red cedar and yellow cedar timber.

The drainage area above the dam is about 8 sq. miles in extent, gently sloping and rising to an altitude of about 2300 ft. The average precipitation observed at the site during the past two seasons is about 85 in. In the winter months this precipitation takes the form of snow, which accumulates at times to a depth of 7 ft. in the reservoir area.

Until the preliminary construction work began this site was unexplored, except for the rough preliminary survey which had been made in 1908 to determine the general features of the project. In September, 1910, the construction of a wagon road from the diverting point to the dam site was begun, and it was only after its completion late in November of that year that a permanent camp could be installed and steps taken to determine with certainty the nature of the material underlying the dam site and the quantity and quality of the material available for the construction of the dam. The winter and spring of 1911 were spent in investigating the dam site and the sites for borrow pits. A series of test pits were sunk and borings taken, and in May, 1911, complete data were obtained from which the construction details could be planned.

The principal dimensions of the dam and reservoir are:

Greatest height above bottom of valley, ft.	57
Greatest height above bottom of sheet-piling curtain, ft.	127
Length of crest of dam, ft.	1017
Greatest depth of cut-off trench, ft.	31
Top width of dam, ft.	15
Width of spillway, ft.	50
Depth of spillway below high-water level, ft.	10
Upstream slope of dam	3 to 1
Downstream slope of dam	2½ to 1
Total volume of dam (embankment measurement), cu. yd.	148,390
Capacity of reservoir above outlet gates with high-water level 5 ft. below crest of dam, cu. ft.	320,000,000
Area of reservoir at high-water level, acres	284
Drainage area above dam (approximate), sq. miles	8

In prospecting the site of the dam to determine the nature of the underlying material, a trench 16 ft. to 20 ft. in depth was excavated along the entire length of the dam axis and following the top of the bedrock as far as the depth of the trench would safely permit. Test holes were put down in the bottom of the trench by driving 3-in. pipe casing to the bedrock. The casing was sunk with churn drills operated inside the casing, the material being removed with a water jet.

The formation was found generally to consist of a stratum of top soil from 2 ft. to 3 ft. in thickness, underlying which was a mass of heavy gravel and boulders. At a depth of from 12 ft. to 16 ft. the boulders diminished in size and gave way to coarse, partly cemented gravel, hard enough to offer considerable resistance in removal with picks, below which and at a depth of about 20 ft. alternating layers of loose sand and gravel-carrying water extended to the bedrock.

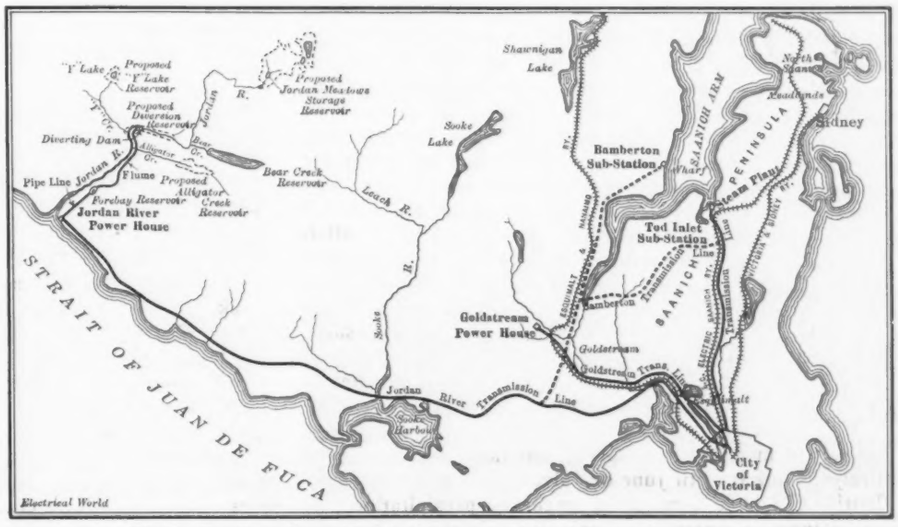


Fig. 2—Territory Served by the Vancouver Island Power Company, Ltd.

With these foundation conditions determined, and in order to provide a secure foundation, not only for the initial structure, 55 ft. in height, but for an ultimate structure which would raise the water level 70 ft. above the floor of the valley and double the capacity of the impounding basin, it was decided to install a curtain of steel sheet piling extending to the bedrock.

After thoroughly prospecting both slopes of the valley, a sufficient amount of suitable material for building the embankment was found on the north side, directly opposite the dam and distant about 400 ft. from the north end of the dam axis. The material consisted of the hard-pan common to the district, gravel and sand mixed with clay, favorably proportioned for sluicing from place into the fill. The borrow pits were 150 ft. to 250 ft. in elevation above the valley floor and afforded a working face or bank 8 ft. to 18 ft. high.

Clearing the timber from the dam site and the adjacent areas was begun as soon as men and equipment could be placed on the work. Powder and donkey engines were used extensively in removing stumps and piling the timber and debris for burning. A single acre in the dam site was found to contain 240 stumps of a size to require blasting for removal. The flowage area was not cleared beyond the immediate vicinity of the dam where clearing was required for construction purposes.

After the clearing was finished and the stumps removed, the forest floor, consisting of partly decomposed vegetation, rotten wood and smaller roots, was removed to a depth of 1 ft. or 2 ft. from the area to be occupied by the base of the dam. Thirty acres of ground were cleared in all, 10.1 acres of which were stumped and 4.1 acres stripped.

A cut-off trench, 6 ft. wide at the bottom, 10 to 31 ft. deep, with side slopes about one-quarter to one, was excavated parallel to the axis of the dam, the center line of the trench being directly under the downstream edge of the crest of the embankment. The material excavated from the trench consisted of heavy boulders, gravel and sand. Steam and hand derricks with skips were used in the dryer parts of the trench, while the section under water near the stream bed was removed with a hydraulic elevator. The total volume of material removed was 8675 cu. yds.

Interlocking steel-sheet piling—Carnegie 12-in., 40-lb. section—was driven in the bottom of the cut-off trench to the slate bedrock. Two pile-drivers with 2000-lb. drop-hammers were used, the driving gangs working night and day. The piles were furnished in lengths of 50 ft. and less, the first shipment arriving at the site Aug. 6, 1911. Hard driving was encountered on the north side of the creek, but no pile was left until it reached bedrock as indicated by the test holes. The piles were driven along the center line of the cut-off trench, and from 4 ft. to 6 ft. was left projecting above the bottom. The trench was thoroughly cleaned before sluicing was started.

A permanent flood-water spillway having a net opening 50 ft. wide by 10 ft. deep below the high-water level of the reservoir was excavated in solid slate bedrock around the

north end of the dam. The spillway cut was about 350 ft. in length by 35 ft. maximum depth, with side slopes one-quarter to one. The larger part of the work was done under contract before sluicing was started, the rock being placed in the downstream toe of the dam.

Six concrete piers were erected in the throat of the spillway, against which timber stop logs can be set horizontally

Fig. 3—Conditions Encountered in Vancouver Island Forest.

to hold the pond at any desired level. A platform or runway extends from pier to pier and an overhead cable with traveling tackle is provided for handling the stop logs.

PILING MATERIAL IN BEAR CREEK DAM.

Total number of steel-sheet piles driven	616
Total length of steel cut-off, ft.	580.5
Net length cut-off per pile, in., about	11 ½
Maximum penetration of pile below bottom of cut-off trench, ft.	68.5
Average penetration of pile below bottom of cut-off trench, ft, about	46.3
Maximum penetration of pile below original ground surface, ft.	87.0
Total piling driven, ft.	28,509.0
Total weight of piling, tons	570

The floor of the spillway is paved between piers and downstream for a distance of 10 ft. A concrete cut-off wall extending into impervious solid rock is provided at the upstream end of the spillway piers. A second concrete cut-off wall, founded on bedrock, extends from the south abutment to the puddle core of the dam. The total quantity of material removed from the spillway was 11,267 cu. yd., of which 10,431 cu. yd. was rock and 836 cu. yd. earth. The masonry used in the piers, cut-off walls, paving, etc., amounts to 110 cu. yd. The material was placed in the dam by sluicing except the rock from the spillway cut, and the material excavated from the cut-off trench, the material not sluiced amounting to 13,985 cu. yd. in all.

A gravity supply of water for sluicing was obtained from a small creek on the north slope of the valley near the dam site. A storage reservoir was built on the ridge near the headwaters of the stream, in which about 1,500,000 cu. ft. of water were stored, sufficient to operate the sluices for a period of five to seven days, depending upon weather conditions. The water was taken from the creek at a point about 2 miles below the storage reservoir in a 10-in. spiral-wound wood-stave pipe, 1300 ft. in length, and discharged into a head-box from which a riveted steel slip-joint hydraulic pipe, No. 12 gage, 8 in. in diameter, was laid to the borrow pits, the water being delivered at the nozzles with a static head of from 150 ft. to 200 ft.

Owing to the necessity of completing the dam in time to store water for use at the power station during the summer of 1912, and in order to preclude as far as possible interruptions in sluicing from failure of the gravity supply, a pumping plant was installed below the dam near the creek and pipes were laid from the pumps to the borrow pits, all arranged to permit changing from gravity to pumped supply with small loss of time. The plant consisted of two three-stage centrifugal pumps, 6-in. discharge, capacity 1000 gal. per minute each, driven with steam engines. Four 50-hp boilers were installed, and wood from the site was used for fuel. The pumping plant was put into service whenever the gravity supply ran low.

Sluicing flumes for carrying the material were erected from the borrow pits and extended the full length of the dam. The grade of slope of the boxes was 6 per cent on the main flumes, the size of box being 16 in. wide by 18 in. deep, built of 2-in. plank and lined in the bottom with wood paving blocks 4 in. deep. The lateral or distributing flumes were built with a grade of from 7 per cent to 9 per cent, were not lined and were made with lap or telescopic joints to facilitate moving.

Three decks or levels of flume were used as the work progressed, the maximum height of supporting trestle being 70 ft. The trestle posts were round poles, cut on the site.

TOTAL LENGTH OF FLUME.

First or lowest deck, ft.	1050
Second deck, ft.	1150
Third deck, ft.	1400
Lateral or distributing flumes	3000
Total, ft.	6600

About 360,000 board feet of lumber were used in the course of the entire work, the larger portion of which was in the sluicing flumes.

Sluicing was started Sept. 1, 1911, and carried forward night and day during the winter and spring until April 15, 1912, when the fill was completed. More or less serious delays, due to freezing weather, snowfall, maintaining temporary spillway through the dam for discharging flood water

MATERIAL USED IN THE BEAR CREEK DAM.

	Cu. Yd.
Excavation measurement:	
Rock from spillway and gravel cut-off trench	13,985
Material sluiced from borrow pits	129,364
Total	143,349
Embankment measurement:	
Completed structure	148,390
Excess of embankment over excavation measurement (3.6 per cent)	5,041

and minor interruptions, were experienced, but in spite of these the average progress was better than anticipated, the estimated date of completion being May 15.

The water in the reservoir was raised gradually as work of building the dam proceeded, no run-off being wasted

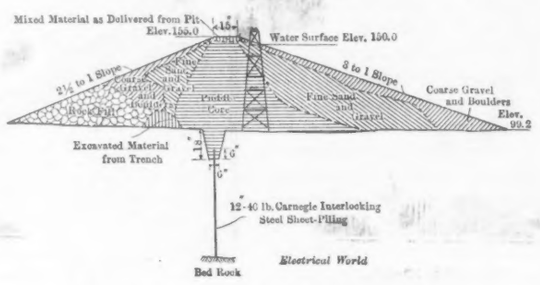


Fig. 4—Section of Bear Creek Reservoir.

after March 1, 1912. At the date of completion the water level in the pond stood at the elevation of the spillway floor. Extremely dry weather conditions prevailed during the spring and the basin failed to fill, the highest level reached being about 7 ft. below the high-water level. The storage obtained, however, 250,000,000 cu. ft., was sufficient

for normal plant operation with one machine during the summer. The second unit which is being installed by the company will not be ready for service before the coming of the wet season.

No attempt was made to break the hard-pan formation in the pits with the water from the monitors. Powder was used throughout the work for breaking down, holes being gophered in the base of the bank to a depth of 10 ft. to 16 ft. A gang of men was kept constantly at work with picks breaking up the larger masses to assist the action of the monitor stream. In fact, it was endeavored at all times to keep the solid material coming at a rate to utilize the full carrying power of the water flowing to the sluices. The quantity of water used in sluicing varied from 3 cu. ft. to 6 cu. ft. per second, which was discharged through 3-in. and 4-in. nozzles in the pit.

SLUICING RECORD—BEAR CREEK DAM.

Date.	Per Cent Time Sluicing	Hours Sluicing.	Water Used, Average in Second-Feet.	Cubic Yards Placed.	Proportion Solids to Water.	Cubic Yards per 24 Hours' Sluicing time.
1911.						
September, 30 days	50.0	504.0	3.53	17,085	7.2	813
October, 31 days...	43.5	322.8	3.2	10,300	7.3	765
November, 30 days	51.9	373.0	6.25	14,950	4.8	964
December, 31 days.	66.4	493.5	6.25	18,150	4.4	888
1912.						
January, 31 days...	85.6	637.0	4.7	19,600	4.9	740
February, 29 days..	99.9	694.5	4.3	29,650	7.5	1110
March, 31 days....	69.2	518.8	3.4	17,300	4.4	802
April, 15 days.....	48.5	174.4	4.3	7,370	7.3	1060
	66.9	....	....	134,405	6.3	893

REMARKS.—October, delay waiting for free or gravity water; November, delay waiting for free or gravity water, due to freezing weather; December, delay due to flood through temporary spillway; January, delay removing temporary spillway; due to freezing weather; March, delay draining fill; April, delay slow work finishing crest.

A temporary spillway was maintained through the dam during the winter season, the maximum observed flood discharge through which amounted to 1300 second-ft. The structure was removed about Jan. 1, 1912, after which and until the elevation of the permanent spillway was reached

Fig. 5—Stop-Log in Spillway, Bear Creek Reservoir.

an emergency overflow spillway was maintained over the dam, with plank apron attached to timbers embedded in the fill extending down the slope. The necessity of using this emergency overflow never arose.

OUTLET STRUCTURE.

Two 30-in. riveted steel pipes, ¼ in. thick, each 300 ft. long, are installed in the base of the dam immediately south of the original stream bed. The trench in which the pipes are laid is excavated in the bedrock and back-filled with concrete which forms a casing around the pipes 1 ft. thick on all sides. At the upper end of the pipes a reinforced-concrete intake structure with screens is provided. This contains two 24-in. hydraulic gate valves with stems ex-

Fig. 6—Bear Creek Dam.

tended to a platform at the top of a structural-steel tower, 50 ft. in height, from which the valves are operated. Venturi tapers were inserted in the pipes on both sides of the valves to minimize flowage losses through the 24-in. valves, made smaller than the pipe merely for sake of economy. The excavation for the outlet works amounted to 3730 cu. yd. and 343 cu. yd. of concrete was used in pipe casing and headworks.

The behavior of the dam since completion has been most satisfactory. Measuring weirs set at points below the dam to intercept the water flowing by the dam show that the aggregate discernible loss on April 4, 1912, was 0.191 second-ft., which was decreased on April 27 to 0.100 second-ft. Subsequent reports indicate that the loss is steadily diminishing as the body of the fill gradually drains out.

The desirability of raising the height of this dam to obtain additional storage will no doubt appear shortly. The undertaking will be comparatively simple with the apparatus now on the site, a safe foundation installed and all the perplexing and expensive features of design, methods and transportation solved. By raising the embankment 20 ft. the capacity of the storage basin may be increased to 608,000,000 cu. ft.

Fig. 7—Forebay Reservoir.

In a subsequent issue will appear a description of the diverting dams, flumes, forebay reservoir, pressure pipes, power house, transmission lines and substations.

NEW STREET LIGHTING IN CHICAGO—1.

Operations Under the Blanket Street-Lighting Contract of the City of Chicago and the Sanitary District.

WORK is well advanced in carrying out the construction features of the contract by which, among other things, the Sanitary District of Chicago is to install and operate 10,000 additional arc lamps (or their equivalent) for street lighting in the city of Chicago. In planning this installation the Sanitary District of Chicago has done some original engineering work in relation to the new 550-watt flaming-arc lamps which are being used, the extensive system of series-tungsten street lighting which is to form a considerable part of the whole installation, the compact design of substations and the arrangements for cable distribution. The work is also noteworthy from the exceptional size of the installation and the powerful lighting units employed.

HYDROELECTRIC ENERGY FROM DRAINAGE CANAL.

As the readers of this journal are aware, the Sanitary District, which is a municipal corporation, operates a 32,000-kw hydroelectric station on the Chicago Drainage Canal at Lockport, Ill., transmitting electricity at 44,000 volts for 30 miles over aluminum wires to a terminal station in Chicago, whence the energy is transmitted at 12,000 volts to various substations, where the voltage is reduced to meet commercial requirements. The generating station, transmission line, terminal station and distribution were carefully described and illustrated in articles entitled "Electricity from a Drainage Canal," published in the *Electrical World* on Jan. 12 and Jan. 19, 1911.

With a supply of energy available from a plant created by taxpayers' money, it was very natural that it should be used for street lighting in Chicago. This has been done for several years, the Drainage Canal energy being utilized first for driving motors operating arc machines in the generating stations of the city of Chicago, which for a long period of years has operated a municipal electric street-lighting plant. Later, transformer substations were built in which hydroelectric energy was used directly for the operation of street arc-lighting circuits.

A COMPREHENSIVE STREET-LIGHTING CONTRACT.

From this condition of affairs the next step was the execution of a contract between the Sanitary District and the city of Chicago by which the former agreed to take over all of the city's thirteen stations and substations used for electric street lighting and to operate them, in addition making a large extension to the municipal street-lighting system. A contract to this effect was executed in October, 1910, and the work performed under this contract is what is described in the present articles under the title "New Street Lighting in Chicago."

Under the 1910 contract the city yielded to the District the possession of thirteen stations and substations and also the transmission and distribution lines used by the city to convey the energy to and from the stations. The city also agreed to permit the District to make such rearrangement of cables, wires and connections as might be agreed upon by the city electrician and the electrical engineer of the District. The city also agreed to allow the District to use any or all of the conduits and transmission lines then installed and owned by the city, this additional use to be for the corporate purposes of the District, provided the transmission lines were not overloaded and that the use by the District of such circuits was subordinated to the obligation of the District to furnish to the city electrical energy for municipal purposes. This permission included the use of lamp poles, provided suitable provision was made for the city's circuits. The District agreed to take over the substations, machinery, transmission lines and other electrical equipment and operate them during the life of the contract.

PROVISION FOR IMPROVED MODERN EQUIPMENT.

In addition, the Sanitary District agreed to change over the existing direct-current arc-lighting system into "an improved modern equipment," and also to constitute a new operative electrical system of 10,000 arc lamps of a type to consume not less than 450 watts at the lamp terminals, in addition to the arc lamps already in service. However, it was stipulated in the contract that in the event of the city electrician and the electrical engineer of the District agreeing that lamps of a different type were necessary in the whole or in part of the new system, the District would furnish lamps of the newer type, with the understanding that the same amount of electrical energy needed for the 10,000 arc lamps should be consumed. It is under this provision that the series-tungsten street lighting is being installed in a portion of the residence district, although the powerful flaming-arc lamps are retained for a larger area.

Fig. 1—450-Watt Flaming-Arc Lamps and Boulevard Type of Poles.

Fig. 2—Type of Pole and Overhead Construction Used in Outlying Districts.

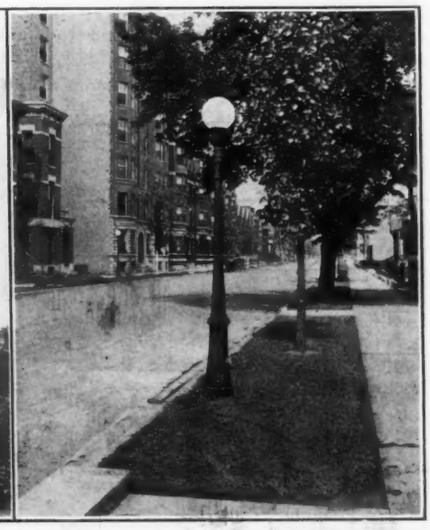


Fig. 3—Series Tungsten Lamps on Lake Avenue, Chicago.

Three pictures given herewith illustrate types of lamps and lamp standards installed. Fig. 1 shows the new flaming-arc lamps, with the boulevard type of poles, the picture being taken on Ashland Boulevard near West Van Buren

Street. Fig. 2 shows the same type of lamp, but with the tubular post and bracket suspension used in outlying districts. This picture also illustrates the extension above the lamp bracket to provide for cross-arm attachment. Fig. 3 depicts 100-watt series-tungsten lamps mounted on former gas-lamp posts in a residence district. The view is one on Lake Avenue near Thirty-seventh Street.

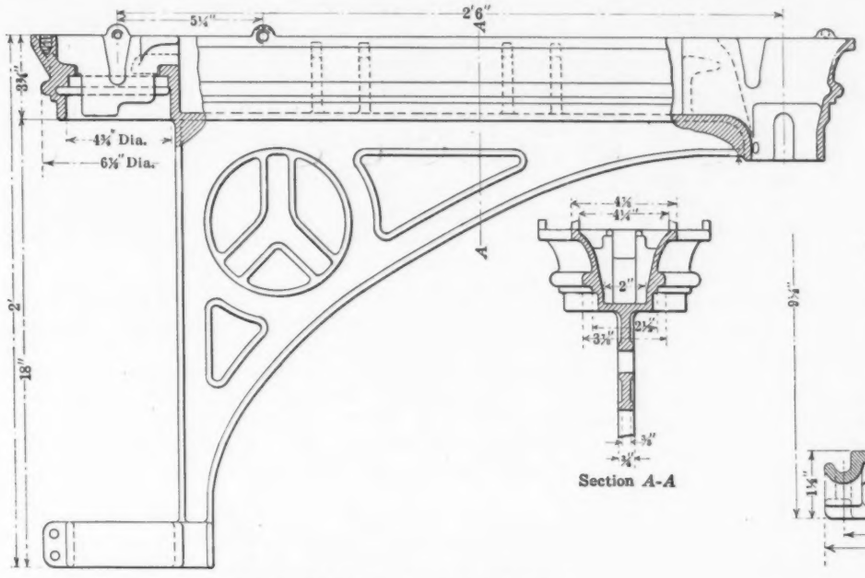


Fig. 4—Details of Arc-Lamp Bracket.

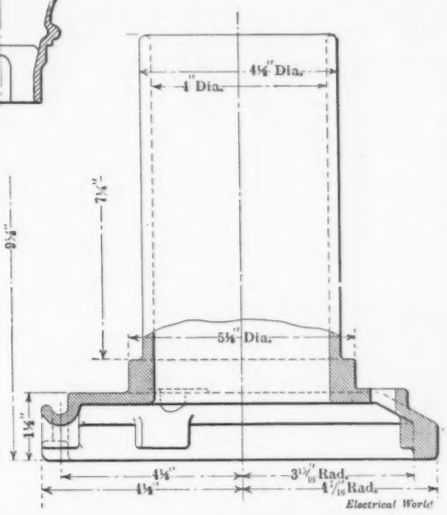


Fig. 5—Detail of Cross-Arm Support.

OTHER FEATURES OF THE CONTRACT.

The city's old street arc lamps, to the number of 12,200 at the time of execution of the contract, were retained as a part of the new system, the 10,000 new lamps, or their equivalent, being additional. However, the old lamps are to be replaced by new ones ultimately. The contract provides that the platting of the new lamps shall be done by the city electrician, and that he and the electrical engineer of the District shall locate the substations. The plans for transmission lines are prepared by the District and approved by the city. The District agreed to construct at least three additional substations, although, as a matter of fact, four have now been built or are nearly completed.

The contract period is seven years from the date that service is first begun. During this time the District agrees to furnish electrical energy to operate both the old and the new lamps of Chicago's municipal electric-lighting system. The rate paid for electrical energy is $15 per hp-year, the electricity to be metered on the primary side of substations. In addition, the sum of 8⅓ cents per month is paid for substation operating charges for every 450-watt lamp or its equivalent. The lamps are to be operated for an average period of eleven hours daily for every day in the year, the hours of burning varying from eight and one-half hours in May, June and July to fourteen hours in November and December. The city agrees to repay the District for all real estate, labor and material used in the new construction work, with interest but without profit. The rate of interest is to be the same as that of the last bond issue of the Sanitary District.

SELECTING THE TYPE OF ARC LAMP.

In carrying out the contract the first thing to be decided upon, before the plans for the extension of the lighting system could be begun, was the type of lamp to be used. At the time plans for making the contract between the two municipalities were first being discussed the magnetite lamp had just reached its full development and was heralded as the up-to-date illuminant for street lighting; in fact, the merits of the magnetite system were so great that it found wide adoption in this country in spite of the somewhat complicated station equipment required. Considerable surprise was created, therefore, when it became known that Chicago was thinking of using a type different from the luminous arc.

Upon the suggestion of the electrical engineer of the Sanitary District, one of the large lamp manufacturers began experimenting with the long-burning flaming-arc lamp, and almost simultaneously a lamp of this type, invented and patented in Europe, was placed upon the American market.

At the time the rehabilitation work was started both lamps were in the experimental stage. The experiments were of such a promising character that it was considered safe to adopt this type of illuminant as the Chicago standard. The lamp adopted may be classified briefly as a 550-watt, 10-amp alternating-current inclosed flaming arc. It operates with from 50 volts to 65 volts at the terminals, and under normal operating conditions each trim will last from 100 to 110 hours.

EIGHT THOUSAND 10-AMP FLAMING-ARC LAMPS ORDERED.

The substation and lamp circuits were laid out for this type of lamp, and while the construction of new circuits was in progress 500 lamps were mounted temporarily on some of the old lamp-posts to secure information about reliability and cost of operation. One-half of these lamps were of the single-globe type, while the remainder were of the double-globe type. Later, on Feb. 15, 1912, a contract for 4000 lamps was awarded to the General Electric Company for a double-globe lamp designed in the Fort Wayne works and manufactured in the Lynn works of the General Electric Company.

These lamps have been in operation several months and have given excellent satisfaction. A second order for 4000 additional lamps of the same type was placed Sept. 12, 1912. The simplicity of station equipment, combined with low cost and reliability of operation, make the flaming arc, in the opinion of the Sanitary District and city engineers, the ideal unit for street lighting where profuse illumination is required.

It was with great interest and some apprehension that both manufacturers and the city looked forward to the amount of electrode trouble to be contended with in this type of lamp. From the records of the city of Chicago it appears that the outages from this and all other causes have amounted to less than 0.5 per cent since the lamps were put into operation.

THE LAYOUT IN THE UNDERGROUND DISTRICT.

In the downtown territory, where underground construction is used, there will be two lamps on diametrically opposite corners at every street intersection and one lamp in the middle of each block at the alley. The lamps will be hung with the arcs 24 ft. 11 in. from the ground on posts, as shown in Fig. 6. The exterior design of this lamp-post was adopted last winter by a special pole committee appointed by the Mayor.

The trimming of lamps in Chicago has heretofore been done by climbing the poles by means of ladders carried by the trimmers and by pole steps. Careful inspection and thorough cleaning are difficult by this method, and locating trouble when a lamp is reported out is almost an impossibility for a man standing on a pole step and reaching out to a lamp suspended from a 24-in. bracket. This naturally developed an expensive tendency to cart all lamps which failed in operation to the lamp-repair shop, where in many instances the trouble was found to be one which could easily have been remedied in the field if the inspector had had better access to the lamp.

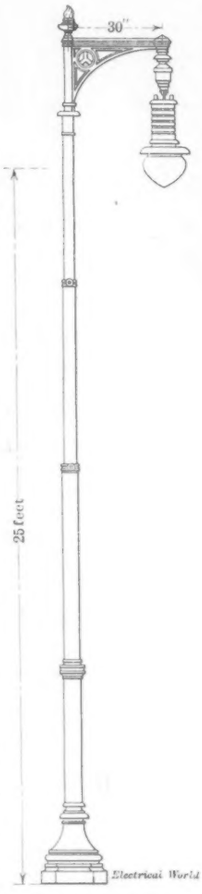


Fig. 6—Type of Flaming-Arc Pole for Underground District.

METHOD OF TRIMMING ADOPTED.

Furthermore, in order to insure the best illuminating results from the new flaming-arc lamp it was necessary to increase the height of the new poles. If the same system of trimming should be maintained it would mean an increase in the number of pole steps to be climbed, and therefore in the labor cost for trimming, which in the city of Chicago is an item as large as, and in some instances even larger than, the cost of electricity consumed by the lamp. It was therefore decided to install series cut-outs and lower the lamps to the ground when trimming instead of climbing the poles. None of the many systems now in the market for this purpose seemed satisfactory or to fulfil the requirements, and new devices had to be designed.

Fig. 6 is a sketch of the new downtown pole, which consists of a cast-iron ornamental base and a tubular pole made of 4-in., 5-in. and 6-in. pipe. The bracket is practically identical with the one used for overhead construction shown in Figs. 2 and 4. It is made of malleable iron and slips over the 4-in. section of the pole, resting with a shoulder on the top of the pole, and has at the lower end a band tightened on the pole with bolts and nuts.

A vertical cross-section of the bracket half way between the pole and the lamp has the shape of a trough, in which are located the steel rope for raising and lowering the lamp and the lead-covered cables leading to and from the stationary part of the cut-out. The steel rope is in the middle, and a section in Fig. 5 shows the notches guiding the rope and preventing it from rubbing against the cable. Two pulleys, a malleable-iron cover and an ornamental pole top, which is fastened to the bracket by three screws, complete the equipment.

VARIOUS TYPES OF POLES.

In the "downtown" type of pole the raising and lowering of the lamp is done by means of a windlass in the base, to which access can be had through a door if desired, but which can be operated without opening the door by inserting a crank in a hole on one side of the base.

Fig. 1, to which reference has been made, shows a boulevard type of lamp-post which was designed for the old lamps and has been in service for several years. The old lamps are superseded by the flaming arcs, but the pole and equipment have been retained.

In districts where overhead arc-lamp construction is used the lamps are all on one side of the street. There will be one lamp at each street intersection and one, or in some cases two, lamps between street intersections. The distance between lamps will be from 250 ft. to 275 ft. All poles used in outlying districts are of tubular steel 30 ft. in length set in concrete. Ordinary line poles are made of 4-in. and 5-in. standard-weight pipe. Ordinary lamp poles are 4-in. and 5-in. extra-heavy pipe. Corner poles and dead-end poles are made in three sections of 4-in., 5-in. and 6-in. pipe. Fig. 2 shows a typical lamp pole of this type with the equipment used in outlying districts.

ANOTHER METHOD OF RAISING AND LOWERING LAMPS.

Many of the present overhead circuits will undoubtedly be put underground later, and with this in mind it was decided to use the same lamp bracket on both the poles used for overhead and those used for underground construction. There is not room enough in the "overhead" style of pole for a windlass, and the raising and lowering of the lamp therefore had to be provided for in a different manner.

The trimmer removes a small cast-iron shield from a hole in the pole. At the lower end of the steel rope for lowering the lamp is a counterweight, to the bottom of which is attached a short piece of chain. The length of the steel rope is such that the counterweight is suspended with its lower end slightly above the opening in the pole. The chain ends in a snatch hook which can be attached to an eye-bolt on the inside of the shield; therefore, when the shield is removed the chain at the same time comes out of the hole. The trimmer carries with him an extension cord with a ring, which he attaches to the snatch hook. By means of this cord the lamp is then lowered and raised.

DETAILS OF OVERHEAD CONSTRUCTION.

The cross-arms are of malleable iron and, as shown in Fig. 2, are mounted on top of the lamp bracket. For this purpose there has been designed a cross-arm support which is screwed on to the lamp bracket in the same three holes as are used in the case of the ornamental pole tops in the downtown district. The upper part of this cross-arm support is shaped as a pipe, with the same outside diameter as the top section of the pole, and it is crowned by a plain cast-iron pole top. Fig. 5 is a sectional drawing of this cross-arm support, which was designed by the Sanitary District engineers. Two-pin, four-pin and six-pin malleable-iron cross-arms are used.

In straight sections of the line the insulators are mounted on locust pins, but Fletcher steel pins with felt insertion are used at corners or dead ends. At most lamp locations so-called transposition insulators are used. They were designed especially for the city of Chicago by the city electrician some years ago and have given good service. They are of the double-groove type and have been manufactured both in electrose and porcelain.

TUNGSTEN-SERIES INCANDESCENT STREET LIGHTING.

The series-tungsten system, which, as before mentioned, will be installed in certain residence districts, will undoubtedly attract wide attention, as it is new and original in many respects. The old gas posts have been and will be remodeled into neat-looking electric posts (Fig. 3) by removing the lanterns and ladder supports and substituting cast-iron post-heads, surmounted by spherical Alba glass globes 14 in. in diameter. Each globe contains a 100-watt, 4-amp, 23-volt tungsten lamp, which, with clear bulb, gives 61.6 mean lower hemispherical candle-power. The posts are placed on both sides of the streets and staggered, so that there is one lamp for each 75 ft. of street.

CABLE LAID IN PARKWAYS WITHOUT CONDUIT.

The laying of conduit for the series incandescent lighting has been avoided and the cost of labor in installing the system greatly reduced by using a single-conductor, lead-covered cable armored with 1/16-in. wall of spirally wound galvanized-steel band which is protected from contact with the earth by layers of tape and jute treated with tar.

A trench 12 in. wide and 2.5 ft. deep is dug in the parkway near the curb, and the cable is laid therein. This work can be done without obstructing the streets or inconveniencing the residents in any way. If the sod is replaced carefully, all trace of the work disappears in a short time. The use of steel armor on single-conductor cable for alternating current is a departure from usual practice, but has given good results.

TESTS ON CABLE LAID IN PARKWAYS.

After the first circuit had been installed the lamp sockets

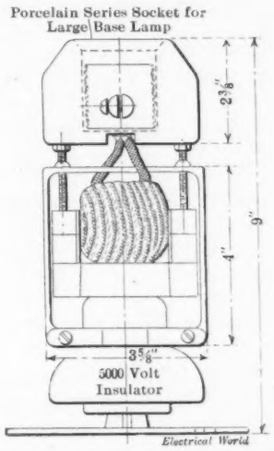


Fig. 7—Reactance Coil for Series Incandescent Street Lamp.

were short-circuited with No. 6 copper wire and the constants of the cable determined as follows:

The copper resistance, measured with direct current, was 12.71 ohms.

Measurements with voltmeter, ammeter and wattmeter at 4 amp and 60 cycles gave the following results:

	Ohms.
Apparent resistance	19.6
Reactance	8.8
Impedance	21.5

The increase in line loss for this circuit, due to the armor, was only 110 watts, at the current for which the circuit is designed.

LAYOUT FOR THE SERIES CIRCUITS.

The incandescent street-lighting circuits, which are laid out for 160 tungsten lamps in series, are fed from the same station bus as the arc circuits and controlled from panels with the same equipment as the arc panels, the only difference being in the ratio of the instrument transformers.

The tungsten-lamp circuits have no regulators in the station, but the current is maintained constant by stationary shunt coils, which here for the first time are used on a large scale. Each cast-iron post head contains a reactance coil wound on a laminated iron core and connected in parallel with the lamp. (See details of reactance coil in Fig. 7.) When the lamp is in operation there is a pressure of 23 volts across the coil and only a small magnetizing current passes through it. When the lamp filament burns out the whole line current passes through the coil and magnetically saturates the core, and the pressure across the terminals rises somewhat, but not excessively. The constants of the coils are so proportioned that the reactive component of the series impedance when added to the remaining resistance component does not appreciably increase the total and the current remains sensibly constant.

At the end of this year there will have been installed and in operation at least 6000 of the new flaming-arc lamps and 1000 tungsten lamps. Half of these will be in new arc-lamp locations and half will replace old direct-current arc lamps.

EFFICACY IN ILLUMINATION.

By Preston S. Millar.

The development of illuminating engineering has been associated intimately with large improvements in the efficiency and other qualities of illuminants. Following closely upon such improvements have come marked advances in the efficacy of lighting auxiliaries. The inauguration and principal growth of the movement have been contemporaneous with the formation and expansion of the Illuminating Engineering Society.

So closely have the three developments conformed in point of time, and so interdependent have they been, that in some respects it is difficult clearly to distinguish cause from effect. The increase in efficiency of illuminants was largely an independent advance, but the growth of knowledge, as represented by the work of the society and the increase in commercial developments, may be said to have been mutually stimulative.

Recent years have witnessed strong tendencies in lighting which were occasioned by practical application of the results of observation and investigation. To-day there is observable a distinct trend in illuminating practice. This trend becomes more evident when modern practice is contrasted with that of a few years ago. To bring out this condition clearly, it is proposed to review briefly the development of illuminating practice in three periods, dealing only with generalities and refraining from discussing developments of lighting which are individual in character.

PERIOD OF NEGLECT OF PRINCIPLES OF GOOD ILLUMINATION.

In the average installation lamps were used merely to light the place. The recognized object was to produce light without excessive cost. Usually the intensity was inadequate owing to insufficient production of light and to neglect of means of applying effectively what was produced. This resulted, not unnaturally, in restricting ameliorating efforts to the installation of more lamps or of larger lamps. So evident was the inadequacy, and so general was the ignorance of good illumination requirements, that considerations of hygiene, esthetics and efficiency were perforce subordinated to the one great demand for more light.

Electric lamps were usually unshaded and were frosted only in rare instances. The existing shades were used generally only upon oil lamps. The oil lamp offered a light source of relatively low specific intensity and of pleasing color, and it was also portable. Its other qualities must be considered as demerits. Being of low candle-power, it had to be placed near both the observed object and the observer, where it obtruded itself objectionably as a source of both light and heat. When shaded, the greater part of the room was shrouded in gloom, only a small area in its immediate environment being illuminated. Yet because of the necessity of placing it near the observed object it had to be shaded, as otherwise it was in the direct line of vision and near at hand. When so shaded it was used alone and there was only one position of observation in which the flame could be reflected specularly from an observed surface to the observer, and that position, naturally, was avoided. Thus many of the more recently developed tenets of satisfactory illumination, which were transgressed by early electric lighting, were complied with fortuitously in the use of the oil lamps. There is to-day a general popular impression that the light from oil lamps is of all artificial light the most satisfying. Ophthalmologists often deem its composition best suited to the human eye. The widespread acceptance

of this belief is the best evidence of the defects of illumination by electric lamps during this early period. Not the superiority of light from oil lamps but the neglect of illuminating engineering in the application of electric lamps has given the oil lamp its reputation.

Survivals of conditions obtaining during this period are seen from time to time in interiors and are quite common in lighting of passenger cars and of streets.

PERIOD OF EFFICIENCY EXALTATION.

Recognition of need for improved lighting conditions led to study of some phases of illumination. Redirection of a large part of the light suggested itself and offered commercial reward to those who might render it feasible. There followed a large extension in manufacture of illuminating appliances—reflectors, globes, etc.

Existing shades were usually very deficient; either they failed to conceal the lamp, or, concealing the lamp fairly well, they absorbed excessive quantities of light. The newer appliances were as a rule fairly efficient and a larger proportion of them shaded the lamp. Moreover, they presented a better appearance. Prismatic glassware, vigorously exploited along broad and constructive lines, became a prominent factor and its installation was generally followed by improvement in lighting conditions. The tungsten lamp, because of its high specific intensity and great candle-power, demanded shading more than did the carbon lamp, and its manufacturers early showed appreciation of the fact by frosting the lower part of the bulbs and by issuing the larger sizes with reflectors which in general improved the light distribution and covered the brilliant filaments.

The further study of illumination brought about talk of efficiencies, and soon it became customary to speak of the illuminating efficiency as the ratio of the light flux delivered upon a given plane to the total flux produced.

To secure highest "illuminating efficiencies" reflectors had to be efficient, and for a time efficiency became almost exclusively the watchword in new illumination work. To increase efficiency, apply more light or reduce bills for energy became the guiding principle of manufacturers of illuminating appliances and their agents. The purpose was a good one, and much in the way of improvement was accomplished.

TRANSITION FROM SECOND TO THIRD PERIOD OF DEVELOPMENT.

While "efficiency" was the ruling consideration, other phases were not altogether neglected. In some quarters the need for more attention to the hygiene and esthetics of illumination was felt, and in consequence the most recent trend in the art began to manifest itself. The development which followed continues to-day and seems likely to continue for some time to come.

In retrospect the principal elements which taken together have contributed to bring about this considerable advance in illuminating engineering stand out clearly. To each may be credited a measurable share of the advance. In the following paragraphs they are discussed briefly.

Improved Efficiency of Illuminants.—The gas mantle, yielding four times the light of the open-flame burner; more largely the tungsten-filament lamp, yielding three times as much light as the carbon lamp, and in a lesser degree the newer arc lamps—these have made possible the notable lighting developments of the past five years. In a way they have necessitated improvement in practice, because high candle-power illuminants demand more intelligent handling, much as do high power explosives. Out of this need and because of the opportunities offered by the new higher efficiency illuminants has come the large extension of illuminating engineering.

Illumination Research.—Study of the physical and physiological aspects of the illumination problem has been pursued earnestly. The research laboratories of the great manufacturing corporations and the less pretentious investigations made possible through the interest of lighting corporations and individuals have extended largely the boundaries of our knowledge of the fundamental principles of good illumination. While investigation serves to reveal the great lack of knowledge and to emphasize the demand for more exhaustive study, yet real progress has been made and it is felt that the success attained in research is an earnest of what is to come.

Growing Appreciation of Esthetics.—In the great majority of installations the requirements are for efficiency and beauty in varying degrees. There are but few installations in which either of these elements may safely be neglected. Several years ago architectural considerations were not properly appreciated by engineers who undertook lighting work. A few there were who gave them proper place in the category of requirements. Chiefly, however, it remained for architects, decorators and fixture manufacturers to urge their importance. To-day the veriest tyro in illuminating engineering recognizes that they must receive consideration in all cases and often in advance of efficiency considerations.

Pioneer Work of Leading Practitioners.—The small number of illuminating engineers who have led the way in successful application of the principles of good lighting, including purely industrial lighting in which practical considerations were predominant, and all gradations of installations up to those in which architectural requirements demanded paramount attention—these men have not hesitated to describe their work in great detail, thereby giving the benefits of their experience to their confrères. This generous spirit has proved very constructive and has played no little part in the development of the art.

Enterprise of Manufacturers of Lamps and Lighting Auxiliaries.—In addition to research and investigation in the field of illumination, manufacturers have done much to promote general knowledge of the subject. Through elaborate systems of bulletins, lectures and papers by representatives, and through illuminating engineering advice contributed for the benefit of their customers, these corporations have done much to advance the practice of lighting and to bring it into line with best knowledge on the subject. Moreover, they have manifested considerable initiative in applying in their manufacture the principles of good illumination as these have come to be recognized in the development of the art.

Improved Lighting Auxiliaries.—An examination of the illuminating glassware and other lighting accessories now being produced in standard lines will demonstrate the advance of the art very conclusively. In general, the tendency now is to conceal the light source, thereby obviating objectionable glare, to reduce or eliminate glare from reflecting surfaces by diffusing the light, and to devote more attention to the appearance of the lighting auxiliary. Where a few years ago one had small choice in selecting reflectors, to-day there is a bewildering variety of reflectors and globes, all having more or less merit and most of them being highly efficient. Corresponding advances have been made in illuminating glassware designed for decorative purposes.

Progressive Attitude of Central Stations.—The formation by many of the larger central stations of illuminating engineering departments whose services are available to their customers, together with the general practice of organizing display rooms for the sale of lighting appliances, has furthered the adoption by their customers of fixtures and lighting auxiliaries, designed in accordance with the more recently recognized principles of good illumination. The practice of some of the largest central stations in issuing tungsten filament lamps to customers under favorable cost conditions has still further aided the development.

Specialization by Numerous Unqualified Practitioners.—The large number of young men who have sensed an opportunity in connection with the growing interest in good illumination, and who have without any justification assumed the title "illuminating engineer," has been the

source of much levity. It is true that the effect has been to bring the title "illuminating engineer" into some disrepute. Far outweighing this objection, however, is the tremendous impetus which such developments have given to the general movement for improved illumination. These men, at first utterly unqualified for the duties they assumed, have gradually learned the principles that should be applied in their practice and are gradually bringing the practice into conformity with the principles. To-day many of them are qualified illuminating engineers, and most of them have accomplished a great deal in the way of improving installation by substituting modern, good equipment for old equipment which had little or nothing to recommend it.

Measuring Instruments.—The general availability of photometric appliances has contributed materially to investigation and to the establishment of lighting criteria, all of which have played a considerable part in improving illumination conditions. The fact that everyone engaged in lighting work has become conversant with the form of photometric data and is accustomed to apply such data in his work goes far toward systematizing that work and rendering practice uniform with regard to established standards.

Illuminating Engineering Society.—Combining in an unusual degree scientific with humanitarian objects, this organization has striven to meet requirements, first, as a forum for discussion of the art and science of illuminating engineering and, second, as an organization for the promotion of education along illumination lines. Its meetings and *Transactions* have stimulated interest and given direction to the development of the art.

PERIOD OF GROWING APPRECIATION OF HYGIENIC AND ESTHETIC ASPECTS.

The above-mentioned contributing elements, complementary and supplementary, have brought about a net improvement which warrants the statement that illuminating practice is now in a third period—one of growing appreciation of hygiene and esthetics. Practitioners have learned that true lighting efficacy does not inhere alone in high illuminating efficiency but is measured broadly by the extent to which an installation serves the purpose for which it is intended. The lighting may be designed in various instances for such diverse purposes as the illumination of accountants' books and the display of the architectural features of a building, the rendering of a drawing room attractive or the brightening of the ceiling and walls of a store to tempt the passer-by to enter; the lighting of a street for vehicular and passenger traffic and the lighting of a street for advertising purposes to attract people to the neighborhood. Each has its own test of efficacy, and whatever its other good qualities, none can be effective unless it achieves the principal object in view.

In this third period one finds for the first time illuminating efficacy raised as the general criterion in the best practice. Subordinate to this are the three leading desiderata—hygiene, esthetics, efficiency. Each of these enters in some degree into every installation, the type of installation and local conditions determining their relative importance.

Stores, and to a less extent offices, have undergone an awakening and in general are now lighted more effectively than other classes of installations. Commercial progressiveness accounts for this. The pendulum has swung to the end of its arc of illuminating efficiency in store lighting. Attractiveness is becoming the keynote, and as thoroughly good and attractive illumination requires more energy expenditure than does merely "efficient" illumination, a greater demand for electrical energy seems to be indicated.

Two classes of lighting installations have not been materially improved. These are residences and buildings having architectural features requiring appropriate illumination. Is the illumination in such installations to be improved in the near future? The need is obvious. How shall it be met?

NEW GENERATING STATION FOR TRINIDAD, COL.

When the Federal Light & Traction Company took over the Trinidad Electrical Transmission, Railway & Gas Company, of Trinidad, Col., extensive improvements were undertaken in the Trinidad generating plant, as noted on page 1249 of our issue of Nov. 18, 1911. The latest development is the opening of a new generating station at a location 1 mile west of Walsenburg and 40 miles north of the Trinidad plant. The two stations are now operated in parallel over a 22,000-volt, three-phase transmission line, for which a second circuit is planned.

The new plant is housed in a heavy brick and concrete structure, with a corrugated iron roof supported on steel trusses and a temporary sheet-iron wall closing the east end of the building, pending future additions to the station. The engine and boiler rooms are each 50 ft. by 60 ft. in floor plan. The boiler equipment consists of four vertical Wickes boilers, installed in two banks, with Dutch furnaces, Murphy stokers fed from overhead steel bunkers and individual self-supporting steel stacks.

Coal supply is obtained from the company's mine 300 ft. distant by means of a motor-driven locomotive crane and bucket, delivering coal directly to the boiler-house bunkers. The mine water supply being unsuitable, the make-up water for boiler feed and condenser circulation is obtained from the Walsenburg public mains.

The generating equipment consists of two Westinghouse-Parsons turbo-generators rated at 1500 kva each, with delivery at 6600 volts, three-phase. One motor-driven and one turbine-driven exciter are located on the engine-room floor. Surface condensers of the Wheeler type are built into the turbine foundations and equipped with electrically driven air and circulating pumps. The heat of the circulating water is extracted in a cooling tower designed by Sanderson & Porter, for which highly efficient heat extraction and low water loss are claimed.

One bank of three water-cooled, oil-insulated, 750-kva transformers is installed in open-faced concrete pits, arranged with a drainage trough of large capacity for carrying off the transformer oil in case of an emergency.

This company transmits energy to coal mines in Las Animas and Huerfano Counties, which lie in the extreme southern portion of Colorado, at such low rates that motor service has replaced many of the steam plants formerly operated at mines and tipples. Commercial and public lighting service is also furnished in Trinidad, Walsenburg and neighboring towns in the two counties. In many of the local districts retailing companies hold franchises for distributing energy to customers and draw their primary supply from the transmission system. The company also operates the street-car service and the gas plant in Trinidad and an interurban road to the mining districts in the vicinity.

NORTH DAKOTA LIGNITE.

Economical methods for the combustion of the brown lignite found in parts of North and South Dakota and Montana has for some time received the attention of government investigators. In a forty-page pamphlet prepared by Messrs. D. T. Randall and Henry Kreisinger the results of a series of tests are presented and analyzed. The authors conclude that the combination of boiler and furnace setting which they describe gives good results with North Dakota lignite, and they state that steam can be produced with a fuel efficiency of 55 to 58 per cent of all the heat in the coal. They experienced no difficulty in working the boiler to full capacity. Equally good or perhaps better results, in the opinion of the authors, can be obtained by the use of mechanical stokers. Although this fuel is generally considered unsatisfactory, they conclude that it may be used with fair economy under boilers at their full rated capacity.

Central Station
Management, Policies and Commercial Methods

THE UTILITY MANAGER AND HIS DUTIES.

The broad character of the utility organization's obligations to the public has been the stumbling block of many managers who failed to perceive why ordinary commercial methods were not applicable in their business, as Mr. W. H. Hodge, of H. M. Byllesby & Company, Chicago, points out in a discussion of aims and problems of public-utility corporations contributed to the Chicago *Evening Post* of Sept. 28. He claimed that even in the larger organizations the personality of the manager stands for the personality of the organization. He is or should be called on to mingle with the leaders of thought and action in his community, and he is compelled to express himself upon many matters not directly connected with the company's affairs.

The manager of a utility company, in a sense, occupies a position with reference to the public somewhat similar to that of a mayor. He has a varied constituency and he should endeavor as much as possible to come in contact with all the people and to obtain a sympathetic point of view. An atmosphere of exclusiveness about the management is bound to result to his company's detriment. His door must be open to anyone who is convinced that he must see him. It is of untold benefit to his organization if it is known throughout the city that he is accessible to the poor and rich alike, and that any person, regardless of age, appearance, nativity or affluence, may come to his office with absolute confidence that he will obtain a square deal in a pleasant way.

STORAGE-BATTERY CENTRAL-STATION PRACTICE IN CHICAGO.

Mr. Donald Macrae, storage-battery expert of the Commonwealth Edison Company, gave an illustrated talk before the technical division of the company section of the N. E. L. A. in Chicago on Sept. 26. The speaker laid stress on the fact that it is impossible to determine the value of a storage battery to a large light and power company. He sketched the history of central-station storage batteries in Chicago, beginning in 1897. The first five batteries installed by the Commonwealth Edison Company and its predecessor have chloride negatives which are still giving satisfactory service. The company uses lead cells entirely in its stationary battery plants, and both chloride and exide plates are used. Exide plates cost less than chloride plates and have greater capacity of discharge. It is interesting to note that the batteries are now used for emergency only and not for long discharges on peak as formerly.

The Chicago company has in use twenty-two system storage batteries; that is, batteries that are discharged into the circuits supplying consumers when needed. In addition, it has seven exciter batteries at stations and fifteen operating busbar batteries for oil switches and reserve station lighting. Records show that in the year 1911 interruptions to service at the company's direct-current substations varied from ten seconds to seventeen minutes in duration, the average being three and one-half minutes. During this period the storage battery carried from 25 to 100 per cent of the load on the substation.

The twenty-two system storage batteries in use in the substations of the Comonwealth Edison Company have an aggregate rating of 21,600 kw at the one-hour rate of discharge. The combined weight of these batteries is 7800 tons and they contain 1600 tons of dilute sulphuric acid. At the eighteen-minute rate of discharge the batteries in the downtown district are nearly equal to carrying the entire downtown load of the company for that period. Curves were given to show how the direct-current areas in different parts of the city are protected by storage batteries, as well as lantern-slide pictures illustrating the various types of lead batteries used in Chicago. Concluding, Mr. Macrae remarked that in his opinion the only practical test of a storage battery is commercial service.

In the discussion Mr. Ernest Lunn, battery engineer of the company, said a good word for the Edison storage battery, which is used on many of the company's electric vehicles. Tests, he said, showed that so far as could be revealed by an experience of from two and a half to three years, the claim of long life made by the manufacturer is justified. The manufacturer guarantees four years' life. However, the first cost of this battery is high in comparison with other types. The company is well pleased with the service of its electric vehicles containing batteries of both the Edison and lead types.

DISPLACING STEAM POWER IN A GROUP OF MANUFACTURING BUILDINGS.

The supply of electric power to manufacturing buildings occupied by a considerable number of independent tenants offers many interesting problems to the central station motor-service engineer. The conditions are seldom uniform in the various establishments gathered under one roof, and out-of-date methods of machine driving are constantly encountered. Many of these buildings are old and have been occupied for years by tenants whose absorption in their own business has led them to overlook the advances of the electric drive in practically every branch of industry. Mechanical power is often paid for in the rental charge along with steam heat and elevator facilities, and in many instances the friction load demands more than half the output of the local plant. Exhaust steam from the engine is generally used in heating during the winter season and thrown away at other times wholly or in part; but even with this favorable condition for the operation of an isolated plant it is frequently possible to install the electric drive and show a substantial profit at the end of the year. In the following paragraphs are given the main points of a successful motor-service survey in a group of factory buildings housing seventeen tenants.

The establishments are located in four brick buildings, from two to four stories in height, and are mainly occupied by pattern makers, manufacturing jewelers, machinists and toolmakers. Mechanical drive of many small machines was used throughout, power being furnished by a Greene engine about twenty-five years old, the steam plant being operated fifty-five hours a week. The engine ran at 84 r.p.m. with an approximate steam pressure of 60 lb., and was supplied with steam by two 75-hp horizontal return tubular boilers. The flywheel was belted to a countershaft on the first floor, from which all other floors were belted.

Tests with the indicator showed a serious overloading of the engine when the factory buildings were working at full capacity. Steam is used throughout the property to operate dryers, sawdust boxes, for heating solutions, etc. In the summer the exhaust steam was passed through a feed-water heater and then discharged into the atmosphere. The building was heated by the exhaust, any deficiency in winter being supplied directly from the boilers through a reducing valve. Coal is delivered to the boiler-room in wagon loads, the storage capacity permitting practically no reserve supply of fuel to be carried. The serious aspects of this situation

were emphasized by the central-station solicitors in securing the patronage of the plant owner. The plant formerly required the services of an engineer at $16.50 per week who handled both engine and boiler service, a helper also being employed for seven months in each year at $25 per month. Water for the plant and manufacturing establishments is purchased from the city mains.

EXCESSIVE FRICTION LOSSES.

In making the power survey a test was made on the engine extending over several days, indicator cards being taken every five minutes and oftener when the load was coming on or going off. Several cards were taken at the noon hour to obtain the friction load of the building. The average load on the engine was 74.6 hp, the total friction load being 63 hp. Less than 15 per cent of the output of the engine was therefore utilized in productive work, and the effect of this condition upon the fuel bill, contrasted with the economy of the electric motor drive, was the yielding point which admitted central-station service into the establishment as a whole. In most of the individual shops the friction loads were heavy, and the lighting facilities were poor, tending to increase the time required to perform each job and to demand a corresponding increase in the coal and water consumption. Under the former system the tenants paid for their floor space and were supplied with mechanical power, heat and water without regard to the quantity of each used, so that each tenant did not pay his true share of the cost of operating the building. It was also necessary at frequent intervals to stop the engine for repairs, requiring all tenants to either stop work or get along without mechanical power. In one or two cases the tenants had already installed motors to permit overtime operations. Once yearly the plant was shut down for at least a week in order that the engine and boilers might be overhauled. No service was furnished by the engine after 6 p. m. on week days or after noon on Saturdays.

COST OF OPERATION BY STEAM POWER.

The analysis of operating cost with steam driving is tabulated below.

Insurance, taxes and interest	$200.00
Depreciation	200.00
Repairs and renewals	175.00
Coal for power service	2,431.00
Water	165.00
Oil	100.00
Ashes, removal	65.00
Labor	1,033.00
Total per year	$4,369.00

The above fuel costs were based on an average evaporation of 8 lb. of water per pound of coal, a steam consumption at the engine of 45 lb per hp-hr., and coal at $4.25 per ton.

ELECTRICAL INSTALLATION.

The survey disclosed the need of fifteen 500-volt direct-current shunt and compound-wound motors aggregating 148 hp and ranging in size from 1 hp to 25 hp. The estimated cost of these motors was $2,254, and the corresponding cost of wiring the factory group was $600. In the actual installation some of the motors already in service were used; very little shafting had to be changed and the cost of putting in the electric drive on the group basis was trifling. It was considered better practice to install a single motor per tenant, as a rule, instead of attempting to provide individual electric driving at the outset. The engine, shafting, hangers, pulleys and belts represented a moderate salvage value which was taken into account in purchasing the motors.

COST OF OPERATION BY ELECTRIC POWER.

On the basis of the following estimated cost of operation by electric power the steam plant was discarded:

Heating by steam	$425
Ashes, removal	25
Labor, one man, firing and misc., $10 per week	520
Repairs and renewals	50
Depreciation	110
Interest, taxes and insurance	125
Central station bill, 7,150 kw-hrs., @ 3.6 cts	2,574
Total per year	$3,829

There was indicated a saving of $540 per year by the use of the electric drive. It was advised in the report of the survey that the plant owner supply energy to his tenants at 4.5 cents per kw-hr., giving a further profit of $1,287 per year and making the total gain due to electricity $1,827 per year. On this showing central-station service was adopted.

WINDOW DISPLAY DURING COUNTY FAIR WEEK.

Recognizing the desirability of suiting the character of a window display to harmonize with current events and the season, the Sterling Consolidated Electric Company, of Sterling, Col., exhibited the window display shown herewith during the week of the Logan County Fair, Sept. 9-14.

Window Display During County Fair at Sterling, Col.

The general manager of the company reports that they received many compliments on this exhibit, the unusual features of which were obtained by making use of stalks of ripened grain in various ways, including the imitation of a lady's dress, as shown on the figure in the center of the display, and also the hedge effect which forms the background. It was estimated that at least 5000 people came to look at this exhibit, although it was situated a half block from the main thoroughfare.

During the same period the company had also on exhibit a motor-driven centrifugal pumping plant, such as would interest farmers in irrigation districts, and found that this developed intense interest among the large number of visitors at the County Fair. These exhibits, the company believes, yielded direct returns in the way of increased business.

HOUSE-WIRING CAMPAIGN IN EMPORIA.

An interesting arrangement has been made between the Emporia (Kansas) Railway & Light Company and leading electrical contractors of that city by which the company is advertising and pushing a house-wiring campaign, the contractors doing the work but receiving their pay at once from the central-station company, the latter collecting from the house owner later. The company does the advertising, soliciting and collecting, and a low rate is made to the owner. A booklet entitled "Electric Service Bulletin" is distributed to the owners of unwired houses by boys supervised by the company's solicitors. The arrangement is outlined in this pamphlet in the following concise manner:

"You 'phone double-nine and ask for our representative. We send him out when you desire. You decide on a house-wiring plan and sign the contract. Also choose your own electrician to do the work. We send out your electrician. He installs the wiring. Our inspector calls and examines

the job before it is accepted. You make the first payment of one-twelfth of the amount of your contract, one payment each month thereafter. We pay the electrician cash for the whole contract price and carry the account. You sign a service contract and make your meter deposit of $5. We connect and set the meter same day, and if you are a home-owner we send out a 6-lb. iron without cost."

Various propositions for wiring five, six or eight rooms, with drop cords and some fixtures, are given at fixed prices ranging from $13 to $24.15. A price-list is given of extra outlets, switches and fixtures, so that the owner of a small house can figure his own combination by taking the base price and adding the extras. If extras are desired after the work is started, the owner must arrange with the contractor and pay him for such labor and material. The flat-iron mentioned above is given free to those who own their own houses. To a tenant who will induce his landlord to wire, a credit memorandum for $2 is given. This can be used to purchase lamps or other appliances. Lamps are not included in the listed wiring propositions. To the landlord who wires for a tenant, a 10 per cent discount is given.

In explaining its liberal offers the company says that the Emporia plant has a larger output per capita than any other in the State of Kansas. Every home not using electric light is considered a loss to the company. The lines are being extended to every part of the city, and the added business is needed to justify the expenditure.

The plan offered is one well calculated to attract residence business. It also indicates a method of securing the active co-operation of the contractors. Mr. Charles A. Bergen is the manager of the new-business department of the company.

CENTRAL STATION HELPS ENGINEER FIND NEW POSITION.

"Situation wanted for faithful employee" was the headline of a display advertisement appearing recently in the Indianapolis papers. "Engineer has been in our employ nine years, but on account of changing our factory to central-station drive, using the service of the Merchants Heat & Light Company, which has demonstrated that it can save us $250 per month over our former isolated plant, we are dispensing with the services of this faithful employee. He is not only a good engineer but a capable mechanic and steamfitter as well. Thoroughly reliable—you can set your watch by his appearance every morning. Never missed a day in nine years, except vacations with pay. Address for further information Capital Rattan Company, Naomi Street, corner Shelby Street, Indianapolis." In using its display space for this worthy purpose the central station struck a new note in advertising the advantages of electric drive, since the unusual heading at once attracted the attention of even casual readers, and a supplanted but faithful employee was helped to find a new position of usefulness.

REDUCING CENTRAL-STATION INSURANCE RATES.

An excellent example illustrating how central-station insurance rates may be reduced by adopting precautions which reduce the fire hazard is found in the case of the plant of the Durango Gas & Electric Company, Durango, Col. This company is contemplating the reconstruction of various portions of its substation and emergency steam plant in Durango, replacing the wood flooring and open wiring with concrete floors and conduit wiring. The gasoline storage tank will be removed from the building, and the lamp-test board, which is now constructed of wood, will be replaced by a slate and metal board. Chemical hand extinguishers will be installed and a fire-alarm box will be situated within the building.

As a result of such changes the fire insurance will be reduced from $1.05 to 54 cents per $100. The rate can be still further reduced by bricking up the openings between the boiler and engine rooms and installing automatic fire doors. This will bring the insurance rate down to 23 cents per $100.

JOINT POLE-LINE CONSTRUCTION PROPOSED FOR COMPETING COMPANIES.

At Glenwood, Col., the Mutual Light, Heat & Power Company, which about a year ago received a franchise, has now nearly completed an overhead distribution system through the alleys of the city, paralleling the lines of the Glenwood Light & Water Company. Short, light poles were used, set directly under the lines of the older company, with so little clearance that actual contacts between the new primary and secondary circuits with the secondary circuits of the older company have been noticed. In some places the new lines swing against the old poles and cross-arms, and quite generally there is a condition of inadequate separation.

Although no energy had been turned on the new system at the last report, the increased fire hazard to buildings served from the lines of the old company caused Mayor E. E. Drach to call for a full investigation and report on the character of fire and life hazards created by the construction of the new system. Mr. W. J. Canada, engineer of the Rocky Mountain Fire Underwriters' Association, has recommended the early adoption of joint pole-line construction with all primary circuits carried at the top of the pole line, or, as an alternative, the construction of another line by the new company on the opposite sides of the alleys, overbuilding the existing telephone lines at a sufficient height to provide adequate clearance.

The new company's central-station plant consists of two 70-hp horizontal, return tubular boilers and one Chuse high-speed engine directly connected to a Fort Wayne three-phase, 2300-volt generator, and also a two-panel switchboard. Street arc lamps will be operated on the Wood system. For lighting service, one 2300-volt, three-phase feeder leaves the station and supplies individual single-phase primary circuits in the individual alleys. The existing poles are 25 ft. and 30 ft. in length with 5-in. and 6-in. tops, and the construction in general follows light telephone practice rather than the standard practice of central-station companies.

The new company is said to be strongly favored by the present City Council, and before Mr. Canada's adverse report was received the purchase of additional equipment was under contemplation. Injunction proceedings, it is reported, will probably be brought by the Glenwood Light & Water Company, which has hitherto served the community exclusively.

MODEL GARAGE AT BOSTON ELECTRIC SHOW

An electric garage space of 6000 sq. ft. has been set apart at the 1912 show in Boston, from two to four men being constantly on duty. Three six-circuit charging panels of 75-amp capacity each at 110 volts have been installed, and the equipment also includes four Westinghouse rectifiers of 30-amp and 50-amp capacity, two General Electric rectifiers of 30-amp and 50-amp rating, and two 5-kw rotary converters of Wagner and General Electric make. The garage prices correspond to those in force at the Atlantic Avenue garage of the Boston Edison Company, a flat rate being charged for exhibitors. Fifty pleasure cars or about twenty-five trucks can be accommodated.

Wiring and Illumination

COST OF POLE-LINE CONSTRUCTION.

In a paper read by Mr. S. B. Hood before the recent convention of the Canadian Electrical Association is contained information of value on the cost of distribution systems. According to the author, for suburban and semi-suburban work a 30-ft. pole line is amply high enough where the run is free of trees or other obstructions. Special cases will, of course, require higher poles, but the average condition is covered by the sizes shown in the accompanying table. The prices here apply to average conditions of labor and material costs in the vicinity of large cities in Canada and the United States.

The cost of pole in the rough is that of good clear British Columbia cedar, with an increase in diameter of 1 in. for every 10 ft. In addition there is the cost of shaving, framing and treating covers, shaving from ground line to roof, taper or wedge roofing, cutting and boring of gains and boring for steps and sockets. The treating, where this is included, consists of a double immersion of the butt to a point 1 ft. above ground line in carbolineum oil. The first immersion should be in hot oil and the second immersion in cold oil.

Painting implies one coat, in pole yard, of entire pole above ground line; this coat preferably to be of a light body paint or stain, such as shingle stain, which will penetrate into the surface for an appreciable distance. The object of painting is primarily to improve the appearance of the pole, as any pole line is objectionable from the public's standpoint and anything that renders it less so is a first-class investment. In addition, a coat of stain undoubtedly does act as a preservative to a considerable extent. The object of stepping and socketing the pole is to prevent its being cut up by continual climbing with spurs, which not only spoils the appearance of the line, but leaves countless little holes or pockets to collect water and drain it right into the heart wood of the pole. Steps are, or shou'd be, standard ⅝-in. by 9-in. hot-galvanized and have a life far beyond that of the pole in which they are to be used. The best form of socket is a malleable-iron or wrought-iron thimble which will drive into a ⅞-in. hole. The hole in the thimble will take a ½-in. lag screw or pin which is slipped in by the lineman when he is about to climb a pole and taken out when he comes down. Four of these sockets are required for each pole, making the first step come 7 ft. from the ground. As the sockets are not readily removable after they are once driven, their life is, of course, that of the pole in which they are placed.

TABLE I.—INVESTMENT AND ANNUAL COST ON POLES.

Size and Kind of Pole.	Cost in Rough.	Shaving, Framing, Treating.	Hauling.	Painting and Stepping.	Setting.	Total.	Life (Years).	Annual Cost.
30 ft.x6 in. plain..	$ 3.06	$1.10	$0.45	$1.35	$3.50	$ 9.46	6	$2.05
30 ft.x6 in. treated.	3.06	2.20	0.45	1.35	3.50	10.56	11	1.49
30 ft.x7 in plain...	5.00	1.10	0.45	1.39	3.50	11.44	7	2.21
30 ft.x7 in. treated.	5.00	2.30	0.45	1.39	3.50	12.64	12	1.69
35 ft.x7 in. plain...	6.00	1.30	0.48	1.64	3.75	13.17	8	2.30
35 ft.x7 in. treated.	6.00	2.60	0.48	1.64	3.75	14.47	13	1.84
35 ft.x8 in. plain...	7.50	1.30	0.48	1.68	3.20	14.76	10	2.21
35 ft.x8 in. treated.	7.50	2.75	0.48	1.68	3.80	16.21	15	1.89
35 ft.x7 in. plain and reset.....	6.00	1.30	0.68	1.84	7.35	17.17	15	1.89
35 ft.x7 in. treated and reset.....	6.00	2.60	.068	1.84	7.35	18.47	20	1.71
35 ft.x8 in. plain and reset.....	7.50	1.30	0.68	1.88	7.40	18.76	18	1.87
35 ft.x8 in. treated.	7.50	2.75	0.68	1.88	7.40	20.21	23	1.76
35 ft.x7 in. treated, re-treated and reset.....	6.00	3.80	1.38	1.64	7.35	20.17	25	1.67
35 ft.x7 in. treated, brush re-treated an reset.....	6.00	3.60	0.48	1.64	7.35	19.07	23	1.65
30 ft. steel pole, painted.....	8.75	.....	0.40	*7.50	5.00	21.65	30	1.62
30 ft. steel pole, galvanized.....	12.75	.....	0.40	.....	5.00	18.15	25	1.63

*Every three years.

The cost of setting given in the table is that for average digging in hard clay or loam. This column for items 9 to 14 gives original cost of setting plus the cost of cutting off, digging out old butt and dropping down and retamping the rest of the pole.

The life of a pole is taken as that where the butt rot at ground line has decreased the sound diameter to that of the top of the pole. This life varies widely with different conditions of soil, climate, etc., but the figures given represent a fair average. For a treated po'e the life is uncertain owing to lack of definite data. The author has taken the increased life as being five years for a pole with 7-in. top, as poles so treated have been under observation for this length of time and some are starting to show signs of decay while others are as good as the day they went into the ground. Where this decay has started there is no means of telling whether it is going to be the same as an untreated pole, or faster or slower. Five years' increased life, is, therefore, taken as the known increase.

The table shows sixteen sizes or combinations of poles suitable for suburban or semi-suburban conditions, fourteen of which are wood. In figuring the annual costs it is assumed that the value of the pole will be entirely wiped out at expiration of the given time. The steps can probably be used over again and the pole may have a slight resale value, but these at best will only cover removal costs. It will be noted that while the investment costs vary by over 100 per cent the annual costs only vary about 35 per cent. Taking the average of these annual costs, which is $1.84, and eliminating all above the average, those given in Table II are left to select from.

TABLE II.—COST OF POLES BELOW THE AVERAGE.

	Cost.	Annual Charge.
30 ft. x 6 in. treated	$10.56	$1.49
30 ft. painted steel	21.65	1.62
30 ft. galvanized steel	18.15	1.63
35 ft. x 7 in. treated, brush re-treated and reset	19.07	1.65
35 ft. x 7 in. treated, re-treated and reset	20.17	1.67
30 ft. x 7 ft. treated	12.64	1.69
35 ft. x 7 ft. treated and reset	18.47	1.71
35 ft. x 8 in. treated and reset	20.21	1.76
35 ft. x 7 ft. treated	14.47	1.84

It is interesting to note that no untreated po'e comes below the average. The 30-ft. by 6-in. appears to be the best, although such a pole is hardly strong enough for supporting transformers, corner poles, etc. Assuming that every fifth pole should have a 7-in. top, the average cost per year would be $1.53. This clearly shows that butt treatment is economical, and if such treatment should turn out to give a life as long as the makers of the carbolineum claim, the economy will be very much greater. For this class of work the author recommends the use of 30-ft. treated po'es for branch secondary lines, using poles with 6-in. tops for straight runs and poles with 7-in. tops for strains and corners. For trunk lines requiring primary wires a 35-ft. pole should be used, 7-in. tops meeting all usual requirements. While the table gives the annual cost of such a pole as $1.84, the actual cost with above suggested arrangement is less owing to the fact that there is a good, framed, 30-ft. pole left from the old 35-ft. when it requires renewing at the end of thirteen years. This brings the annual cost of the 35-ft. pole down to $1.33, or less than the 30-ft. pole. This saving would, however, not be possible unless 30-ft. poles were used for standard branch lines.

CONDUIT VERSUS OPENWORK IN PLACES SUBJECT TO MOISTURE, CORROSIVE FUMES, STEAM, ETC.—I.

By F. G. Waldenfels.

VARIOUS methods of wiring have been tried in places subject to moisture, corrosive fumes, heat, salty atmosphere, pickling vapor, steam, etc., such as are found in packing houses, breweries, tanneries, etc. In fact, such places have had to be wired and rewired at very short intervals for years, and although all kinds of experiments have been tried with different supports, wires, knobs, insulators, screws, sockets, cut-outs, cabinets, snap switches, etc., wiring practice is not much further advanced than it was ten years ago, because so long as open work is tolerated so long will mechanical injury to wiring be a detrimental factor.

In packing houses electric circuits are subject to severe treatment. Each building is used to carry on a certain branch of the business, and the conditions in one building are different from conditions in the other, thus calling for special wiring methods. Some sections of a building are wet with condensation which collects on everything; in other sections water drips from the ceilings and runs through the floors below; while in still others steam is ever present. In the pickling department there is the salty atmosphere, in the glue houses and tank rooms corrosive fumes have to be contended with, and there are many other departments demanding special electrical treatment. Thus in a single packing house there are extremely wet places, excessively cold places, and places where the corrosive fumes destroy all kinds of insulation. Each of these places has conditions that must be recognized and each condition has a certain effect on the different kinds of wiring.

The writer has had many years of experience in the construction field and has been in many different plants studying methods which have given the best results at the most reasonable first cost. The different installations will be described in detail, attention called to their defects, and improvements recommended with a view to encouraging the use of conduit.

Up to the present time to meet the severe conditions encountered in packing houses, breweries, etc., open wiring has been most extensively used, although a conduit installation is occasionally found. For certain reasons electricians are very skeptical in using conduit in such places and even hesitate to employ conduit or pipe for the risers. If asked what their objection against conduit is they will invariably claim that it corrodes, or that it is subject to condensation, or that they are not accustomed to pipe work. While it is

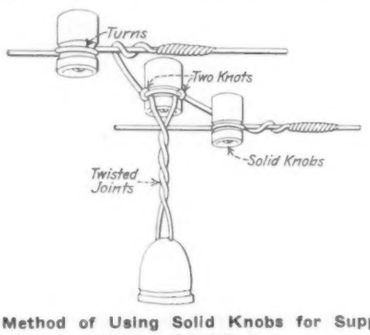


Fig. 1—Old Method of Using Solid Knobs for Supporting Line Wires and Drops.

admitted that conduit will corrode and that some kinds will even rust faster than others, still if one gets the right kind—the latest that the manufacturers have developed—he will find that the conduit job will last longer than any style of open work, if it is properly installed. Moreover, such a job will not be as expensive as others employing some classes of open work, such as, for instance, pin and insulator work with 3-32 in. rubber-insulated, triple-braided wire (see Fig. 2), or knobs with like wire, and at the same time conduit assures a greater factor of safety and reduces the electrical fire hazards. Slaughter houses are generally wet from top to bottom and a hide cellar can be found on the first floor in the majority of cases. So much water is used on all the floors that if these are not watertight it drips through to

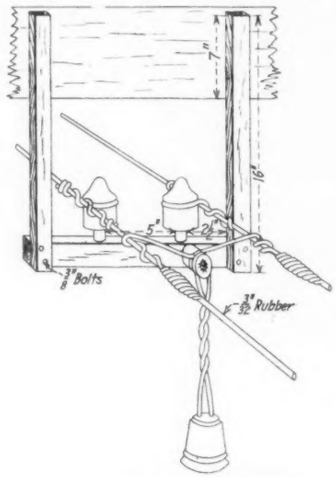


Fig. 2—Pin and Insulator Work.

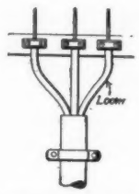


Fig. 2A—Loomed Wires in Conduit.

the ceiling below, and so on down through to the first floor. It therefore devolves on the electrician to install the best system of wiring that he knows of with special reference to security, safety and permanency.

In very wet places with water on the floors, walls and ceilings an installation is required that will give the best insulating qualities, and particular pains must be exercised to keep the system free from grounds. To accomplish this many methods have been employed. The methods hereinafter described have been found especially serviceable in wet places, hide cellars, tank rooms, fertilizer plants, glue houses, salt storages, casing rooms, excessively hot places and excessively cold places, etc.

Where ceilings are low the employees extinguish the lights by turning the lamp in the socket, thereby twisting the joints on the drop wires until the bare wires come together, causing a short circuit and possibly flames that will feed along the conductors and set fire to combustible material. If the joints are not properly made, taped and then compounded, any amount of trouble can emanate from them. For such installations it is recommended that composition or hard rubber sockets be used. Porcelain sockets are too fragile in low places and are better suited for high ceilings. In wet places all metals on sockets, switches, cut-outs, etc., are subject to rapid corrosion, but this can be greatly reduced in cabinets if the latter are maintained as dry as possible by keeping a lamp burning in each all the time. Snap-switch covers could be painted with asphaltum or lacquer; the knife-switch blades could be painted with vaseline or lacquer; in fact, all the terminals on the cut-outs, etc., could be coated with vaseline to good advantage. Strange to say, brass T. & H. base-key sockets when protected have given better results in wet and steamy places than weatherproof sockets. They were first painted with white lead, then taped with friction tape, then painted again with white lead or asphaltum. The No. 14 stranded wires entering the ⅜-in. cap of the socket were first taped and then treated with compound to keep out the moisture. This gave a non-corrosive, unbreakable socket and the lamp circuit could be opened or closed with a key.

CORROSIVE FUMES.

Corrosive fumes are encountered in tank houses, glue houses, hair houses, fertilizer factories, casing rooms or

wherever steam emanates from a hog. In the tank house the offal of the plant is boiled and worked into fertilizer, ammonia and sulphur mixed with the ingredients. The steam from these tanks attacks and corrodes metal very readily. Open wiring has always been installed in these places, but there are several plants where sherardized and galvanized conduit have been in use for more than two years with very good results.

SALTY ATMOSPHERE.

In places full of salty atmosphere, such as salt storage and hide cellars, open work reigns supreme, but in spite of this fact some conduit is installed for the mains and rises, and this is holding out as well as the open work. The wires come from the floor above, in circular loom, which is inclosed in common galvanized-iron water pipe. (See Fig. 2 A). The loom and the pipe are taped and shut with compound at the top so as to exclude water.

In hide cellars all methods of wiring have been tried, including the inverted trough. The ceilings in such places are about 7 ft. or 8 ft. high and open wiring is always in the way and therefore always subject to mechanical injury. When a workman wants to extinguish any lights he simply turns the lamp in the weatherproof socket. This practice should be discouraged because the continual twisting finally affects the wires at the joints, breaking the strands one by one until the current is carried by only one or two strands of each polarity. When a circuit is reduced to this condition the small strands heat up or a short-circuit occurs and the ensuing fire readily runs up the wires to the ceiling.

The iron screws in the knobs are also attacked by the salty water, causing them to rust and expand, thereby cracking the knobs, especially if they are of glass, and allowing the wires to drop. Conditions in casing rooms are worse than in tank rooms, because in casing rooms an acidulous paste coats everything and this paste destroys the insulation of wires and motors.

CONSTRUCTION OF BUILDINGS.

At the present time most packing houses are of old-time construction or have been remodeled, and at their best are poor structures. They are continually being repaired and altered. The floors are leaky and do not hold the water, allowing it to seep through to the floor below, and with the water continually dripping safe wiring is a problem. Open work is usually installed in these places, and one can imagine how long it will last when continually soaked with water. Because of governmental sanitary precautions a great deal of soda is used in the water for scrubbing the floors after the slaughter, and soda is very injurious to wiring.

Very often rotted beams and crosspieces have to be replaced, which necessitates loosening the supports for the wires, allowing them to slacken toward both ends. Carpenters very seldom notify the electrician when alterations are to be made, and if wires are in their way they knock them loose and leave them in that state, which has been found to be very hazardous.

ROUGH MECHANICS.

Pipefitters and machinists also have an inherent habit of knocking wiring supports loose and leaving them in an extremely dangerous condition. The workmen in general are foreigners, often ignorant, rough and careless, and think nothing of destroying electric wiring. A set of rules printed in different languages, with especial reference to better respect for electric wiring, would help a great deal if violation of them was backed up by dismissal.

ELECTRICIANS.

Competent help is one of the essential features for this special work. The great trouble is that the wages are not such as to attract good electricians. No matter how good a man is, if he has reached the limit of $3 for nine hours he can quit if not satisfied. The writer has observed very closely that most of the men hired are friends of some employee who want to be electricians. These "green" hands are willing to put up with conditions found in packing houses and the small pay offered to beginners for a while only. They have to be taught first how to do this special work which only an expert should do.

When the green hand becomes proficient he asks for more pay, and if this is not forthcoming he quits, leaving the job open for another green hand to be broken in. It is unreasonable to expect good work under such conditions and, needless to state, the best material on the market looks like a wreck when installed by a novice.

It actually requires an effort to do a good class of open work, because there are many small details that need conscientious attentions, whereas with conduit work better results can be obtained with inferior workmen, because it only has to be fitted together, and it is easier for the inspector to detect defects, which would have to be looked for at the drops of outlets only.

SOLID KNOBS.

Where low ceilings are encountered, certain classes of open knob work are installed. Fig. 1 shows the type of wiring that has been used almost universally for all kinds of places in the past. Here No. 4½ standard solid porcelain knobs have been employed for the line supports and to anchor drops. This system proved unsatisfactory and was found very defective.

Such an installation was made as follows: Every 4½ ft. a pair of knobs was screwed to the woodwork, with a separation of 6 in. Then the electrician followed with the line wire and gave it a twist around each knob. The operation required the services of two men, one to hold the wire taut while the other went along and twisted it around each knob. No. 14 stranded rubber-covered wires were used for the drops, and, in order to anchor them on the solid knob, two objectionable knots were necessary to fasten the drop properly. Then the drop wires were extended to the joints on the line wires after a few turns. It will readily be appreciated that two knots drawn tight on a No. 14 wire is not beneficial to the insulation, neither is it beneficial to twist the wire around the knob or around the line wires, because all these small twists, turns and knots break the rubber insulation of the conductor. In many cases the insulation wears thin at the knots on account of the strain from handling the lamp or from extensions, causing short-circuit and flames, which readily feed on the rubber-covered wire, resulting in many fires. If a line knob should get broken or be knocked from its place, which is often the case, the whole line on that side is slackened and the least strain will pull it from some more knobs and finally the whole line is down.

PIN AND INSULATOR.

In places where the ceilings are high, over 9 ft., the pin and insulator system has given the best results, as far as insulating qualities are concerned; but this method of wiring requires much space and is constantly disturbed by the pipe fitter and mechanic, and therefore needs constant repairing to keep it in working order.

To make an installation of this kind requires an expert wireman. There are so many important details involved that if any is neglected abundant troubles ensue. The construction is as follows: The hangers and cross pieces are of 2 in. x 4 in. lumber, dressed and painted with red mineral paint. The pieces are fastened together with ⅜-in. galvanized-iron bolts, and the insulator pins are set and fit in holes in the cross piece. Ordinary glass petticoat insulators are screwed on the pin and No. 12 B. & S. gage wire with a 3-32 in. rubber insulation is employed. It will be observed that the rubber is just twice the thickness of ordinary No. 12 wire. Tie wires are employed to fasten the line wire to the insulator and for this purpose two ways are employed, as will be shown in a future issue. No. 14 stranded rubber-covered wires are used for the drops, and they are generally

anchored from a standard No. 4½ split knob. This knob has two grooves for the wires, while at the same time separating them an inch before being twisted. Very often the drops are anchored from the line wires after a few turns, before being fastened to the joints, but in this case such a method of anchoring is discouraged. The joints are a very important feature and should be made as described under another heading. Composition mica, porcelain or hard-rubber sockets should be used.

The pin and insulator system of wiring is expensive, costing slightly more than a conduit installation. The extra cost arises from the use of the special 3-32 in. rubber-covered wire, which amounts to about $50 per 1000 ft., or about four times the price of ordinary rubber-covered wire.

Various other phases of the subject will be treated in several instalments, which will appear in subsequent issues.

FIRE ENGINEERS' ELECTRICAL SIGN.

In the accompanying photograph are shown some of the striking electrical decorative lighting used in connection with the Denver convention of the International Association of Fire Engineers. The view is one looking southeast along

Illumination at Denver Convention of the International Association of Fire Engineers.

Seventeenth Street. The appearance of water flowing in a stream from a nozzle in the hand of a fireman is obtained by incandescent lamps controlled by a sign flasher, the effect being thoroughly appropriate to the occasion.

IMPROVEMENTS IN THE ILLUMINATION OF A GRILL ROOM.

The grill room of the Great Northern Hotel, Chicago, 160 ft. by 50 ft., was formerly lighted by 268 carbon-filament lamps exposed directly to the vision of patrons. There were thirty-five ceiling fixtures marking the centers of the panels, each fixture carrying five 16-cp lamps. Around the walls of the room and on the columns are seventy-five brackets, each of which was formerly equipped with a 16-cp unit. The interior decoration was in general dark, the wal's being paneled with deep-red mahogany, although the ceiling was light. The walls include a number of mirrors, and these added to the efficiency of reflected illumination.

Very recently the grill was rehabilitated, the woodwork being converted to ivory finish while the ceiling was retinted in a cream color. For each of the thirty-five five-unit cei'ing fixtures an indirect bowl unit was substituted. Each bowl contains a 100-watt tungsten lamp inclosed in an X-ray reflector, the light from the concealed lamp being projected first onto the ceiling and thence diffused into the room. The 16-cp units in the brackets were replaced by 25-watt tungsten lamps, provided with shades edged with fringe, the latter helping to break up the direct rays emitted from the filaments.

With the new light-colored interior and the indirect lighting from the ceiling fixtures a degree of illumination is obtained which is equally satisfactory and much more rest-

Lighting of Great Northern Grill Room, Chicago.

ful than with the old direct lighting, while the energy consumption is hardly one-half the former amount. The 268 16-cp carbon lamps formerly used consumed about 15,000 watts. The present thirty-three 100-watt ceiling units and seventy-five 25-watt wall-bracket lamps consume altogether but 6175 watts. In the new arrangement the illuminating value of these exposed bracket lamps is doubtful, whi e it is likely that they introduce glare in the field of vision which nullifies their use as lighting units, but in the interior decorative scheme the brackets have an ornamental value and add greatly to the monotony of pure indirect lighting.

ENTRANCE LIGHTING OF ST. LOUIS BOULEVARDS.

In the better-class residence section of St. Louis there are a number of exclusive streets and parkways set off from

Entrance to Hawthorne and Longfellow Boulevards, St. Louis.

the public thoroughfares by ornamental gateways designed to give privacy to the residents within. This class of community boulevards has become very popular in the Missouri metropolis, since the householders of the district are able to restrict the advent of newcomers and the purposes to which property in the addition is put. Most of the handsome city homes of St. Louisans are located in these park-

ways. The accompanying illustration shows the attractive entrance gateway to Hawthorne and Longfellow Boulevards, with the attractive bracket fixtures which carry ball-inclosed tungsten lamps for illuminating the street. This bracket also serves as the support for the bronze title tablet imparting to the wayfarer the name of the addition.

ORNAMENTAL LIGHTING USED AS POLICE AUXILIARY.

Control of the ornamental street-lighting installation recently completed at Marion, Ind., has been carried to a switchboard in the office of the chief of police, so that after regular lighting hours, in case of alarm of burglars or highwaymen, the lamps can be flashed on while the police are scouring the streets and alleys. This arrangement has proved effective several times when suspicious characters were seen loitering around the downtown stores and was also of aid during a recent midnight fire.

Fig. 1—Lamp Standard at Marion.

There are fifty of the posts, each carrying four 60-watt lamps and one 100-watt lamp. The circuit is balanced by taking all the top lamps off one phase, and alternate lower-lamp groups off the other two phases, thus permitting the top lamps to run all night if desired. The installation was made by the Marion Light & Heating Company, at a cost of $50 per post, which was apportioned among the property

Fig. 2—Iron-Pipe Arm Entry Construction.

owners and tenants on a basis of $1.15 per front foot. The lamps are operated by the city, energy being purchased on a meter basis at the rate of 1.5 cents per kw-hr. Fig. 2 shows the iron-pipe entry at the police switchboard, following the practice of the Marion company in making extensive use of iron-pipe construction for cross-arms, etc. (see page 1316, *Electrical World*, June 15, 1912). Two 1½-in. galvanized pipes were bent to shape and fixed to the building wall by flanges, while the insulators are mounted between them on through-bolts and the house taps taken up and in through conduit outlets.

COLUMN TRANSPARENCIES FOR STREET DECORATION.

During the recent "street show" in the automobile district of Michigan Avenue, Chicago, that broad thoroughfare was decorated with ornamental pillars and festoons

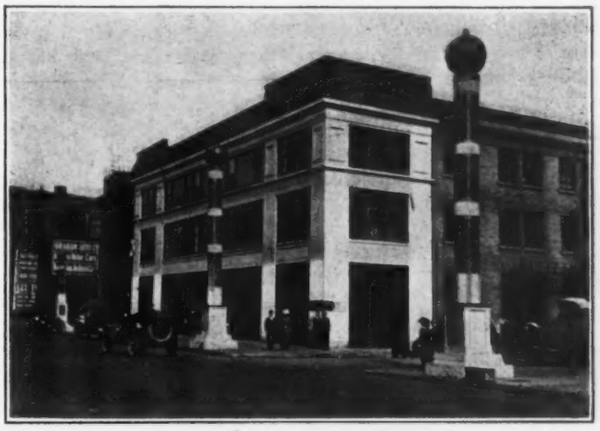


Fig. 1—Corner Columns with Translucent Panels and Balls

of lamps from Twelfth to Eighteenth Street. The corners of intersecting streets were marked by 30-ft. columns surmounted by 6-ft. balls. Intermediate between these corner pillars were four 20-ft. pillars capped with 3-ft. balls and decorated with green branches. Suspended between the posts were hung festoons of 8-cp carbon lamps at 18-in.

Fig. 2—Columns in Middle of Blocks.

intervals. The balls on the pillars and certain panels of the uprights themselves were rendered transparent by coating wire netting, like fly-screen, with a tenuous, translucent varnish or paint, presenting an effect, when lighted, like art glass. This was also heightened by lining the panels and tinting them various colors. Inside the columns strings of lamps were suspended to light the transparencies.

RECENT TELEPHONE PATENTS.

AUTOMATIC SYSTEMS.

While the automatic system has enjoyed considerable use commercially, it has not been fully reduced to standard practice and there is still much difference of opinion over the best means of applying the principles of automatic operation. Consequently the call-sending and switching mechanisms present a great variety. The same comment applies to the semi-automatic systems, which may be considered a subdivision of the automatic. This point is well brought out by a patent recently granted to Mr. H. O. Kabitzsch, of Hamburg, Germany, for displaying the number wanted by a calling subscriber as a printed numeral before the operator. In order to accomplish this, a swinging arm is provided at the central office, which arm may raise, against the force of gravity, digit sectors. The arm is driven by a solenoid, the pull of which corresponds to a variable potential adjusted by means of a potentiometer under control of the sending keys at the subscriber's station. When any particular number is desired the subscriber sets up his sending keys accordingly. This causes the arm at the central office to rotate until the angular displacement of the sector is such as to display the first desired digit. The arm then returns, leaving this sector latched in position, and upon the next forward swing sets up the second digit, etc., until the desired number is displayed. When the operator completes the call she restores all sectors to normal simultaneously. This affords a means of transmitting the called number to the operator without direct audible communication.

Mr. E. E. Clement, of Washington, D. C., has recently obtained two patents for automatic devices. One of these describes an automatic switching apparatus. According to this system the contact banks are arranged upon a segment of a hollow cylinder and are composed of horizontal and vertical rows. The axes of the individual contacts, however, are vertical, and therefore the rotary motion of the wipers is made the first operation, while the plane of the wipers is below the contact bank. The vertical motion then follows. The apparatus contains the usual rotating, elevating and releasing elements, these being mounted upon a common frame. One novelty lies in a stationary shaft upon which rides a sleeve carrying the ratchets and wipers; therefore the parts never extend beyond the limits of the frame no matter what the position of the wipers in the contact bank. As is usual with automatic systems, the selection of any desired number is a question of coordinates.

Mr. Clement's second patent relates to a unit system for the erection of automatic or other telephone systems. Unit steel cases are provided having cable and wire space at the rear; at the front are slotted guides into which may be slipped the various connectors. These connectors are arranged as nearly as possible in a single plane, the contact bank being mounted independently of the connector apparatus. By this system the contact banks may be mounted in the cases and permanently wired. The selectors may then be slipped into the guides so as to register with the contacts. In order to confine the contact bank to a single plane the individual groups are mounted in vertical rows, in groups of ten. One set of wipers is provided for each group and to these wipers an angular displacement is given corresponding to the notches on the rotating ratchet. It will thus be seen that only one wiper is in position to engage its contact group for each angular position of the switch. Thus ten vertical and ten horizontal steps cover 100 contacts. In this system it is planned to extend the installation by adding unit cases, one or more at a time, as required.

Another automatic device has been patented by Mr. J. W. Lattig, of Rochester, N. Y., the patent being assigned to the American Automatic Telephone Company. This patent is entitled "impulse transmitter" and describes the sending device of an automatic system. The various numerals to be sent are arranged consecutively upon the dial, each numeral being represented by a hole in the dial. To send a number a pin is inserted in the corresponding hole and then the dial is rotated until the pin encounters a permanent stop. Upon releasing the dial it returns to normal and drives a gear train which transmits the desired impulses.

Letter to the Editors

THE MASCULINE ELECTRIC CAR.

To the Editors of the Electrical World:

Sirs:—Nothing could be better adapted to the use of ladies than the typical electric passenger vehicle which is such a familiar object on the streets of American cities. Quiet, dignified, unobtrusive, cleanly, easy to operate and control, starting at the touch of a switch, of few and simple parts, and not apt to get out of order, it is not strange that the electric brougham should be the ideal ladies' car, most appropriate for calling, pleasure riding, shopping or the theater. But have not these manifest advantages been accepted so complacently that we have identified the electric pleasure vehicle with women rather than with men? Is it not a fact that we all have a tendency to consider the electric carriage as nice, correct and lady-like, but really not quite the thing for a strong, virile man—this man "with red blood in his veins" or "the man in the street" that we hear about?

There is nothing namby-pamby in the electric vehicle per se. Consider a three-ton electric truck used by a brewer for delivering barrels of beer! There are many such. The electric commercial vehicle is essentially a business proposition brought to the attention of men, and it is doing well in competition with gas trucks. But when it comes to pleasure riding or passenger vehicles, is it not true that the average man considers the electric car as something in the nature of a toy, and for his own use, even for riding around town, goes in for an imposing roadster or touring car that must in effect be a small locomotive to propel its own great weight? Why is this so? All the stock objections to the electric car account for this prejudice only in part. It seems to be "up to" the manufacturers of electric pleasure vehicles to convince a great army of possible users that their product is something more than a dainty contraption for the ladies.

For one thing, more attention might be paid to the designing of electric vehicles to be attractive to men. Most men do not care over much for the coupés, victorias and broughams which are so popular with the manufacturers. A well-nourished man is apt to feel a little cramped in one of these luxuriously upholstered interiors. Would it not be well to emphasize to a greater extent large, roomy, open cars, with some dash and "class" to them, conveying the idea of power and strength, with good appearance, but without the ponderous, moving-machine-shop aspect of the gasoline car? It cannot be said that such cars as here intended—cars neither slavish copies of the typical gasoline touring cars nor carriages looking much like stylish horse-drawn "turnouts" minus the horses—do not exist, but at any rate it may be said that they are not common. Such cars ought to appeal to doctors and to many other business and professional men, among whom there are comparatively few users of electric vehicles.

A familiar advertisement represents Henry George as saying "I am for men!" If the quotation is correct, the author meant, no doubt, that the word "men" should stand for all mankind—men and women. The electric automobile, too, is for the service of men and women both, but there should be styles suitable for all classes of users, and its attractions for women should not be dwelt on so exclusively as to feminize it in the minds of men.

Pittsburgh, Pa. James Robertson.

Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

Generators, Motors and Transformers.

Resistance of Contacts.—LUDWIG BINDER.—There is a very intimate connection between the passage of current from brushes to commutators or slip rings and the passage of the current at the point of two contacts. The author has investigated the nature of the resistance at the point of contact. He shows that the hypothesis of an air film between the two contacts is wrong. The contact resistance is a purely ohmic resistance, at least as long as the contacts are dry. The very high resistance of a contact is due to the fact that the current passes only at one single or a few points, so that the lines of current are considerably contracted. The author gives the results of tests of various contacts like those between steel globe and steel globe, steel globe and copper plate, steel globe and lead plate, steel globe and carbon, etc.—*Elek. u. Masch.* (Vienna), Sept. 22, 1912.

Parallel Operation.—LEE HAGOOD.—An article on the operation of synchronous machines in parallel. The author takes up chiefly the question of the economical control of the exciting or wattless current in a system so as to obtain suitable voltages at the centers of distribution, and the economical use of the generators, transformers and transmission lines involved. The importance of this problem appears chiefly where inductive loads occur.—*Gen. Elec. Review*, October, 1912.

Lamps and Lighting.

Metallic Filaments.—D. H. OGLEY.—The author gives results of numerous tests of modern metallic-filament lamps which show that as a general rule the watts vary as the 1.6th power of the impressed volts. From extended life tests on a constant-voltage circuit of a batch of lamps of each of the best-known commercial makes the author concludes that both drawn and pressed filaments become entirely crystalline after use, and that when in this condition no difference in strength exists between the two. The only question is as to the period of time that elapses before the crystalline state is attained; it appears that the drawn filaments crystallize more slowly, and, therefore, are stronger at the beginning and during the initial stage of the run. This increased strength at the commencement obviously assists in the manufacturing process and render breakages in handling and transit less numerous. Resistance-time curves are given which are thought to exhibit the crystalline nature of both drawn and pressed filaments. "At no two periods were the resistances identical; an increase or decrease in the case of the metal lamps seems a matter of chance, and this clearly could only occur when the subject under examination was of a crystalline nature." The relationship between candle-power and volts is given for tungsten, carbon and tantalum lamps in Fig. 1; the relationship between candle-power and current in Fig. 2. The variation among the tungsten filaments is considerable, probably due to the different manufacturing processes. The carbon in this respect is equal almost to the best tungsten

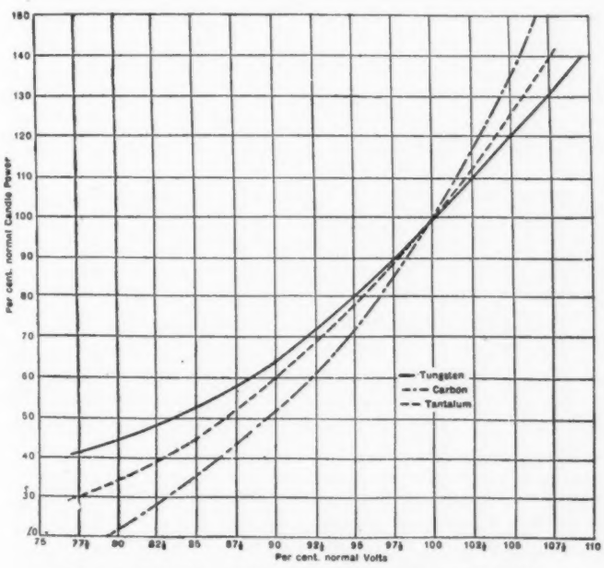


Fig. 1—Relations Between Candle-Power and Volts.

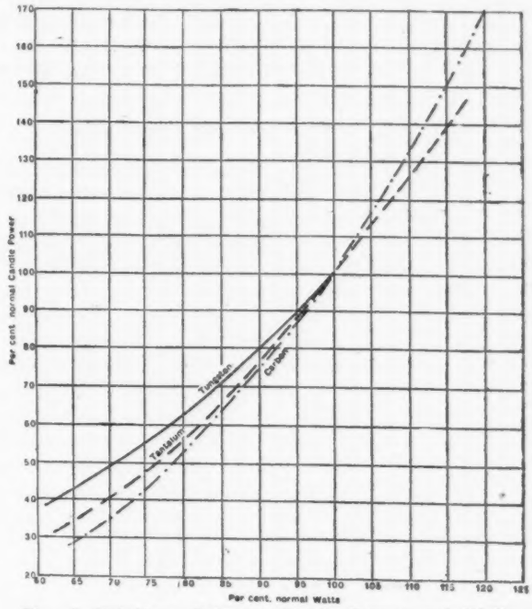


Fig. 3—Relations Between Candle-Power and Watts.

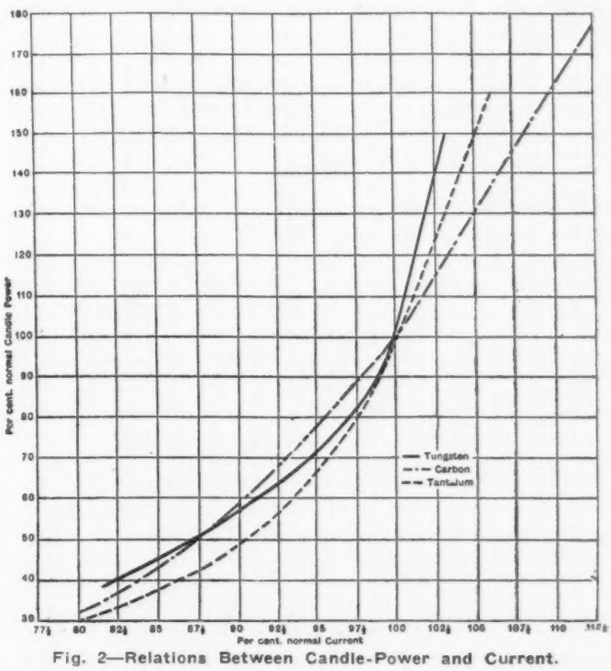


Fig. 2—Relations Between Candle-Power and Current.

and superior to the tantalum. It would appear that the practice of running lamps, when used for sub-standards in making photometric measurements, at a fixed current is the correct one. A potentiometer method is, of course, the one that ought to be adopted in maintaining a constant current. Fig. 3 shows the relationship between candle-power and watts. Curves are also given of the change of candle-power and specific power consumption with time. The efficiency of the metal-filament lamps remains practically constant for the greater portion of their lives. It seems that such lamps would serve admirably as photometric sub-standards, as the curve for the carbon lamp is varying continuously.—London *Elec. Review*, Sept. 20, 1912.

Generation, Transmission and Distribution.

Power for Small Shops.—E. Vollhardt.—In a paper by Hoeltje the problem was investigated whether gas engines or electric motors are cheaper for industrial purposes in small shops, and the conclusion was reached that this depends on the number of hours per year for which the power is used. The present author has extended his investigations, and results are given in different curves for different comparative prices of gas and electricity. The results are in general very favorable to electric motors. The smaller the capacity the greater is the superiority of the electric motor. Only for machines above 10 hp which are used for at least two or three hours per day and for smaller machines which are used for a great many hours during the day gas engines have economical advantages, if they are always fully loaded. In such cases where a machine is not always fully utilized the electric motor is always superior. In Berlin at the end of last year 32,800 electric motors with 130,000 hp were connected to the central station, while the number of gas engines was 422 with a capacity of 6600 hp. The final conclusion is that with the present prices of gas and electricity the electric motor is pre-eminent in small shops. For larger capacities for very long hours of operation the heavy gas engines may be employed. With the usual hours of work in small shops the 12-hp electric motor is still superior to the gas engine.—*Elek. Zeit.*, Sept. 19, 1912.

Gas Turbine.—Dugald Clerk.—A British Association paper giving a summary of various researches on the gas turbine, especially those by Armengaud, Karovodine and Holzwarth.—London *Electrician*, Sept. 13, 1912.

Traction.

Single-Phase Traction System in France.—P. Chazaux.—The network of railways in the Haute-Vienne district has a length of 345-km (210 miles) and comprises four principal lines around Limoges. The single-phase system is used at 10,000 volts and the energy is furnished by two plants, one a water-power plant of 2400 hp at Eymoutieux and the other a steam plant at Limoges. The equipment of the water-power plant and of the trolley lines is described.—*La Houille Blanche*, July, 1912.

Installations, Systems and Appliances.

Municipal Electricity Loans.—J. H. Bowden and F. Tait.—The authors contend that the action of the London County Council in further reducing the periods of loans in respect of buildings, mains and machinery is ill-advised. The effect of such short periods is to throw a heavy burden on the undertaking when such loans are current, followed by a sudden relief (and consequent abnormal profits) upon their extinction. During such periods of relief there would be a tendency either to reduce the price per unit unduly or for the profits to be used for the relief of the rates. The authors claim that depreciation should be allowed for at the rate of 10 per cent per annum in respect of machinery and accumulators and 5 per cent in respect of buildings, the estimate being based on the written-down values, this allowance being independent of the sinking fund.—London *Electrician*, Sept. 20, 1912.

Wires, Wiring and Conduits.

Corona Losses.—K. Zickler.—The conclusion of his paper on the calculation of corona losses on high-tension transmission lines. From laboratory experiments of the author, he concludes that the general reliability of Peek's formula must be doubted.—*Elek. u. Masch.* (Vienna), Sept. 22, 1912.

Electrophysics and Magnetism.

Hysteresis.—T. F. Wall.—A paper on the hysteresis loss in iron due to a combined pulsating and rotating magnetic field. The author describes experiments which were undertaken with a view to discovering whether the two simultaneous hysteresis effects, due respectively to a pulsating and a rotating magnetic field, can be superposed without mutual reaction. As a result of these experiments he reaches certain definite conclusions which are set out in full in the paper. Some of these conclusions are as follows: The rotation hysteresis torque is very considerably reduced by the pulsating action of the flux for those values of the frequency which are usually employed in practice, namely, for frequencies between 20 and 50 cycles per second. The reduction is about 60 per cent for the range of flux densities used. The rotation hysteresis torque is, within wide limits of frequency of pulsation, constant, and for all practical values of the frequency may be considered to be the same for any frequency. As the hysteresis frequency becomes reduced to very low values, the rotation hysteresis torque approaches in magnitude the value deducted from a curve connecting rotation hysteresis torque and direct current in the stator winding.—London *Electrician*, Sept. 20, 1912.

Electrochemistry and Batteries.

Aluminum.—A. H. Cowles.—An illustrated paper read before the International Congress of Applied Chemistry on a new process due to Kayser and Cowles. The starting materials are salt, clay and lime. The products are alumina, hydrochloric acid, caustic alkalies and a white hydraulic cement. A plant for the operation of the process has been erected at Sewaren, N. J.—*Met. and Chem. Eng'ing*, October, 1912.

Electric Furnace in Foundry Practice.—An illustrated article by Paul Girod on the use of his electric steel furnace in steel-foundry practice. The same issue contains abstracts of two papers read before the American Foundrymen's Association, one by G. H. Clamer and Carl Hering on the electric furnace for brass melting, and the other by C. A. Hansen on electric melting of copper and brass.—*Met. and Chem. Eng'ing*, October, 1912.

Pinch Effect.—An artic'e on "the recent work of Carl Hering" concerning the pinch phenomenon, the stretching of a conductor by its current, and the design of his electric furnace based on the pinch phenomenon.—London *Elec. Review*, Sept. 20, 1912.

Units, Measurements and Instruments.

Meter Errors.—S. M. Powell.—An illustrated article pointing out that with the small margin of profit allowed to central stations by the rates now in force meter errors of 2 per cent or even 3 per cent may be of great financial importance as regards the net profit realized. The author gives a long English translation of a French paper by A. Durant, of the Central Laboratory of Electricity in Paris, on various sources of errors in electric meters. These are discussed under the following headings: temperature, voltage variations, friction, external magnetic fields, short-circuits, shunts, creeping, frequency, vapor, power-factor, transformers, eddy currents, construction and erection. After referring to some special meters, the author deals with the calibration curves, the starting of meters, and tests in place.—London *Elec. Review*, Aug. 30, 1912.

Electric Measuring Instruments.—Goldschmidt.—An illustrated paper read before the Berlin Electrical Society on a new design of precision moving-coil voltmeters and

ammeters. Their permanent magnets are in the form of tungsten-steel rings, with a punched hole at the place of the poles. The construction is shown in Fig. 4, the moving coil being removed in the illustration from its hole in the ring magnet. The ring magnets are made in a simple manner by winding tungsten-steel ribbon in spiral form around a core.

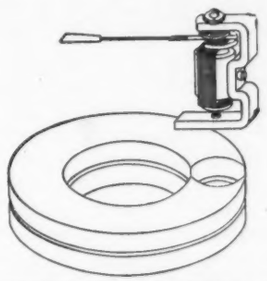


Fig. 4—Construction of Precision Moving-Coil Voltmeter.

All parts are interchangeable. The author also describes an air-damping arrangement used in his electromagnetic voltmeters and ammeters.—*Elek. Zeit.*, Sept. 19, 1912.

Power-Factor of Three-Phase Circuit.—H. N. Lucas.—An article illustrated by diagrams on the determination of the power-factor of a three-phase circuit by means of two single-phase watt-hour meters.—*Elec. Journal*, September, 1912.

Three-Phase Wattmeters.—C. R. Riker.—An article giving a series of vector diagrams showing correct and incorrect methods of connections of three-phase wattmeters and watt-hour meters and the effects which incorrect connections have on the measurements and how mistakes can be repaired.—*Elec. Journal*, September, 1912.

Base-Metal Thermocouples.—O. L. Kowalke.—A paper giving the results of an investigation in which the variations in the emf of various types of base metal couples were determined when heated over different lengths and also after several heat treatments.—*Met. and Chem. Eng'ing*, Sept. 12, 1912.

Reichsanstalt.—An English translation in abstract of the report of the German Reichsanstalt for 1911.—London *Electrician*, Sept. 20, 1912.

Telegraphy, Telephony and Signals.

Bimetallic Telephone Wires.—In order to improve mechanical strength, bimetallic wires have been introduced into telephone practice, having a core of steel and a cover of copper. A line of bimetallic wire of 4 mm (5/32-in.) diameter, weighing 109 grams per meter (1.15 oz. per foot), the weights of the steel and of the copper being equal, was recently strung between Paris and Lyons in France and measurements were made on the part of the line between Villeneuve and Melun (27.5 km, or 17 miles, length). The results are shown in the accompanying table, giving the electric properties per kilometer (1 km = 0.62 mile) for this bimetallic wire in comparison with a pure copper wire of the same diameter.

	Copper.		Bimetallic.	
	Frequency per Second		Frequency per Second	
	430.	1010.	430.	1010.
Resistance (ohms per km)	2.85	2.82	5.60	5.55
Self-induction (henries)	2.39×10^{-3}	2.31×10^{-3}	2.39×10^{-3}	2.27×10^{-3}
Capacity (mirofarad)	5.7×10^{-3}	5.1×10^{-3}	5.65×10^{-3}	5.1×10^{-3}
Damping	23×10^{-4}	23×10^{-4}	40×10^{-4}	40.1×10^{-4}

The bimetallic wire of 4 mm (5/32 in.) diameter is quite inferior to a copper wire of the same diameter. It does not permit communication over greater distances than 800 km (500 miles) and seems equivalent to a pure copper wire of 7/64 in. diameter.—*La Revue Elec.*, September 13, 1912.

Transatlantic Cables.—K. W. Wagner.—The first part of an illustrated article on the various transatlantic cables of the different countries and the new German cable to South Africa.—*Elek. Zeit.*, Sept. 12, 1912.

Submarine Telegraph Cable.—H. W. Malcolm.—The conclusion of his long mathematical serial on the theory of the submarine telegraph cable. In the concluding instalment he considers the effect of an inductive leak and shows that "the effect of the inductance is to lift the arrival curve up over the steady value to which it afterwards sinks. The steepness of the curve would lead one to expect a considerable increase in the speed of signaling were this plan adopted with a coil of the right dimensions." In summing up the serial he says its object was to establish a systematic method of attacking by calculation all the problems that arise in connection with submarine telegraphy. By the application of this method the answer may be obtained to many questions which have hitherto been without solution. Such applications are, for example, to find the arrival and the sending currents and voltages with various arrangements of apparatus, to derive the theory of the inductive shunt, the theory of leaks, of inductive leaks, and of the cable with continuously distributed leakance, and to extend the "KR" law to include the signaling apparatus. The difficulties in the way of high-speed, long-distance telegraphy seem by no means to be insuperable, and it is probable that the near future may see the speed of telegraphy greatly increased. But to bring this about, theory and experiment must go hand in hand. "As evidence of the experimental work that requires to be done, it may be pointed out that there is no available record of the observation in ordinary units of even the simplest arrival curve, although this curve has been known for half a century. When the problem of the high-speed submarine telegraph cable is attacked with the modern resources and the scientific knowledge that have won success in other branches of electrical science, notably in telephony and in radio-telegraphy, a great transformation may be anticipated."—London *Electrician*, Sept. 20, 1912.

Photo-Telegraphy.—An illustrated article on a new method of Korn for transmitting pictures electrically. He has now given up the use of selenium, as it permits only a very small current to be transmitted along the line, and is, therefore, unsuitable for long lines. He has adopted another method for transmitting, somewhat similar to that of T. Thorne Baker, using a copper sheet prepared by a photographic process from the original negative. It resembles a halftone and consists of parallel lines in gelatine upon a copper surface, the lines being of greater or less width; that is, in the blacks we have wide gelatine lines which cover nearly all the space, and in the white these lines are very narrow. Such a copper sheet is put around a metal cylinder, resembling a phonographic cylinder, and against it bears a metal point. As the point traverses the gelatine line it breaks contact for a greater or less time, according to the width of the line, in the well-known way, in order to give the transmission. In the receiver, Korn's photographic method, with some modifications, is retained. The photographic film is wrapped upon a cylinder rotating within a dark box, and upon the front cover is a small aperture for the entry of the beam of light. In the path of the beam is a galvanometer shutter, which works on the Einthoven principle. An electromagnet energized by a storage battery affords a strong permanent field, across which is stretched a thin metal strip, and this latter receives the current from the line. It is thus deflected when current passes and moves off the path of the narrow beam of light, allowing it to enter the film box. The transmitter and receiver are combined in one apparatus and are in turn operated by a common synchronous motor. A synchronizing impulse is sent over the line at each revolution so as to make the correction

for speed in the usual way. The copper plate can be quickly made from the photographic negative by the use of arc light or daylight, and the copper sheet has the great advantage of allowing the use of a larger current on the line. The Paris daily journals are beginning to use blocks made by the present method, and the description of an event which happens in the south of France in the afternoon appears the next morning in Paris along with the illustrations.—London *Electrician*, Sept. 20, 1912.

British Association.—A report of the British Association meeting held at Dundee from Sept. 4 to 11.—London *Electrician*, Sept. 13, 1912.

Book Reviews

Mémoires sur l'Électricité et l'Optique. Par A. Potier, Annotated by A. Blondel, with a preface by Henri Poincaré. Paris: Gauthier-Villars. 330 pages, portrait. Price, 13 francs.

Owing to a modesty, both personal and intellectual, which restricted knowledge of both the man and his work, the subject of this handsome volume did not during his life receive beyond his immediate circle the recognition as a savant and technician which it is in part the object of this volume to secure for him posthumously. As an instance of this modesty, Professor Blondel states that Potier would never consent to the publication of his portrait or of a biographical sketch—a disinclination, we may say, of which the *Electrical World* has had direct evidence.

In his preface Poincaré, who so recently also joined the great majority, pays an eloquent tribute to the character and ability of his subject, as does also in other pages Professor Blondel, the editor of the book and a one-time pupil of Professor Potier. "His elevation and the integrity of mind," writes the former, "gave him a rightful authority in all that relates to natural philosophy; his kindliness, his modesty, his indifference to honors, the rectitude of his character, made him loved and esteemed by all; and in his latter years the serene tranquillity with which he supported cruel bodily trials, the incessant effort to maintain his soul above the ruins of his body, made us admire his courage as we already admired his ability."

As pointed out by both Poincaré and Blondel, though a savant by inclination, Potier had also a highly developed sense for the practical, or at least for the practical that illustrated theory, as is exemplified in particular by his work in connection with the epoch-making Paris electrical exposition of 1881. His reports of that period on dynamo-machinery, motors and transmission of power will always remain of great historical value, and the method of tests which he in collaboration with Tresca and others then devised and applied was the foundation upon which the art of electrical testing was later erected. He was also prominent in the discussions which led to the adoption in 1881-2 of the practical system of electrical units. A high service of another order was rendered in connection with the translation into French of Maxwell's great work, to which Potier contributed some of the explanatory notes that give to the translation such a high value to all students of the great master, not excluding English-speaking students.

Poincaré in his preface dwells more particularly on the high merit of Potier's work in optics, while Blondel treats in greater detail his work in electricity and supplies annotations to the reports of papers on this subject. Among those of more theoretical nature are papers on the subject of electrodynamics and induction, in which as early as 1873 Potier pointed out that the phenomena involved admitted of numerical treatment that could aid in imparting a clearer and more complete understanding of their practical bearing than it was possible to obtain from the classical treatises; on the propagation of heat and distribution of electricity; on the theory of contact electricity, the determination of the electrochemical equivalent of silver, the measurement of energy, the calculation of self-induction and the energy of currents.

Under the head of electrotechnics is a series of papers, some of which have played an important part in the development of electrical engineering. The first in date—1889—is on armature reaction, in which the whole subject is systematically treated, principles defined, the rôle of self-induction for the first time brought out clearly, and auxiliary poles suggested for correcting the ill effect of variation of position of the line of commutation with load. A paper dated 1900 on alternator armature reaction has partly for subject a method by which quantities proportional to the self-induction and counter ampere-turns may be determined by means of a characteristic and a simple triangle. In a paper on the operating diagrams of transformers and synchronous motors (1894-5) the circular diagram is first described which has erroneously been credited to Osanna. Space forbids mention of papers of little less importance, the last in order of publication (1902) being an elegant treatise on transient phenomena in alternating-current circuits.

Professor Blondel has rendered a notable service to physical science and to electrical engineering in thus bringing out in collected form the more important writings of Potier and in extending their value by his able annotations; and at the same time the work constitutes a gracious tribute to the memory of one of those rare characters who go through life content if they can serve a high purpose, and whom acclaim for achievement is apt to disturb as indicating a suspicion of the unselfish nature of their devotion.

Traité de Métallographie. Par Félix Robin. Paris: A. Hermann. 464 pages, 244 illus. in text, 460 reproductions of micro-photographs.

The growing specialization in physical science is illustrated by this treatise, relating to a branch of knowledge which only began to be systematized in 1895 and yet is now represented by a volume comprising over 450 large octavo pages, 244 illustrations in the text and no less than 460 reproductions of micro-photographs. The greater part of the work deals with the microscopic examination of broken and polished sections and of polished surfaces which have been subjected to corrosion. Its scope, however, extends to physical examinations of metals in general and includes the study of the electric spark drawn from a specimen, the effect of an electric arc on a polished surface, the determination of electrical conductivity and of the degree and the retentivity of magnetization.

The author follows Osmond's classification under three heads, of steels with relation to magnetism: First, non-magnetic steels, which are defined as those containing 25 per cent of nickel or 13 per cent of manganese, or less when the carbon content is large; second, steels incapable of permanent magnetization, which are those of low carbon content and slow cooling, and also steels containing a maximum of 12 per cent nickel or 3 to 5 per cent manganese; third, steels capable of permanent magnetization, such as tempered steel and those of low carbon content containing 12 to 24 per cent nickel or 3.5 to 7 per cent manganese. As to the magnetic alloys of non-magnetic metals, it is suggested that manganese may be magnetic at an extremely low temperature and that the admixture of copper and aluminum together with tin or lead may act to raise this temperature limit.

To all having to do with the control of metal-making processes, or with the inspection or test of metals, this treatise will be invaluable, not only because of the vast amount of information contained, but also because of its remarkably practical character. In this respect the volume is virtually a working handbook.

New Apparatus and Appliances

ELECTRIC ROADSTERS FOR BOSTON.

The Edison Electric Illuminating Company of Boston, Mass., has recently placed on order for four additional Bailey roadsters for use by its representatives in covering its large territory of 600 sq. miles. The company now has in use or on order twelve of these cars, and the service analysis of the past year shows that the machines covered 20 per cent more than the required mileage. The company has been searching for two years for an electric vehicle capable of covering 80 miles in four hours on average roads with average grades, prior to the purchase of the first two units of the above design. The second set of six roadsters followed a test made in October, 1911, when a run was made from Boston to New York over a distance of 244 miles in twelve hours and twelve minutes running time. In a recent test one of these machines was run from Boston to Pawtucket, R. I., and back, about 78 miles, and thence over roads about Boston until 103.2 miles had been covered. No representative of the manufacturer was present at the test, and the roads were in good condition, although several steep hills had to be surmounted. The battery was first given a normal charge and discharge to ascertain its condition, and then a normal charge prior to the run. The car was equipped with fifty-two new Edison "A-6" cells and carried two men. An average speed of over 20 miles per hour was maintained for the entire distance covered. The data shown in the accompanying table were secured.

Battery Capacity Test.

	Charge.	Discharge*.
Ampere-hours	326.0	236.0
Kilowatt-hours	28.71	14.46

*Discharge carried to point where cells averaged 1 volt each.

Data of Run.

	Distance.	Time.	Aver. Miles per hour.	Amp. Hours per mile.
To turning point in Pawtucket..	39.2	1 hr. 48 min.	21.77	2.68
First 75 miles.....	75.0	3 " 34 "	21.03	2.80
Battery down to 1 volt per cell..	86.9	4 " 9½ "	20.90	2.76
Total run.....	103.2	5 " 7½ "	20.14	2.76

CLOCK FOR ADVERTISING ELECTRIC SERVICE.

A large electric clock sign containing more lamps than any previously built has been erected by the Edison Electric Illuminating Company of Boston, Mass., on a building at the intersection of Boylston Street and Massachusetts Avenue, in the Back Bay district. The sign is supported on a 40-ft. by 50-ft. framework carrying the word "Edison" at the top in letters 6 ft. high and the words "Power" and "Light" at the bottom in letters 5 ft. high. The outside diameter of the clock dial is 34 ft., the height of numerals on the face is 5 ft., the lengths of the minute and hour hands are 17 ft. and 10 ft., and the decorative and lighting effects are obtained by 6500 incandescent lamps of many colors. The general design represents mermaids disporting in a fountain surrounding the clock dial. The clock is electrically operated.

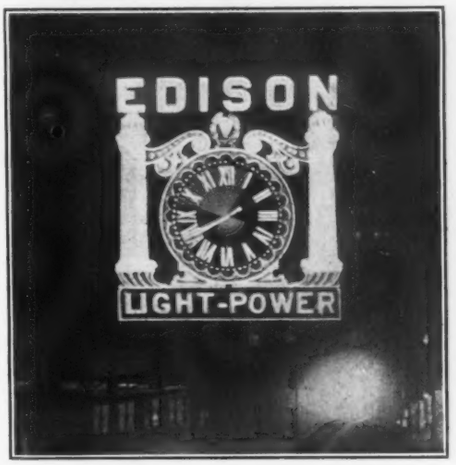


Fig. 2—Large Electric Clock Sign.

The operating mechanism is controlled by a pendulum movement which is arranged to close the solenoid circuit, which in turn operates a relay switch, thereby energizing a motor which revolves the hands. The shafts of the clock are equipped with roller bearings, and the hands, which weigh almost 1000 lb., are properly counter-balanced. The electric fountain on each side of the clock contains 1400 lamps, which are operated by the sixty-eight-circuit high-speed flasher shown herewith. This flasher was built by Betts & Betts, 256 West Fifty-fifth Street, New York, for the Federal Sign System (Electric).

POLYPHASE MOTORS.

The Mechanical Appliance Company, of Milwaukee, Wis., well known as the maker of Watson direct-current motors, has recently augmented its line of polyphase squirrel-cage and slip-ring, wound-rotor motors to include standard sizes up to 45 hp for 110-volt, 220-volt and 440-volt circuits. Restricting the sizes up to only 45 hp is in line with the company's policy to concentrate on motors for individual drive principally. The illustration shows the general appearance of the "type K" squirrel-cage motor. On the rotor of this type the bars between the core and short-cir-

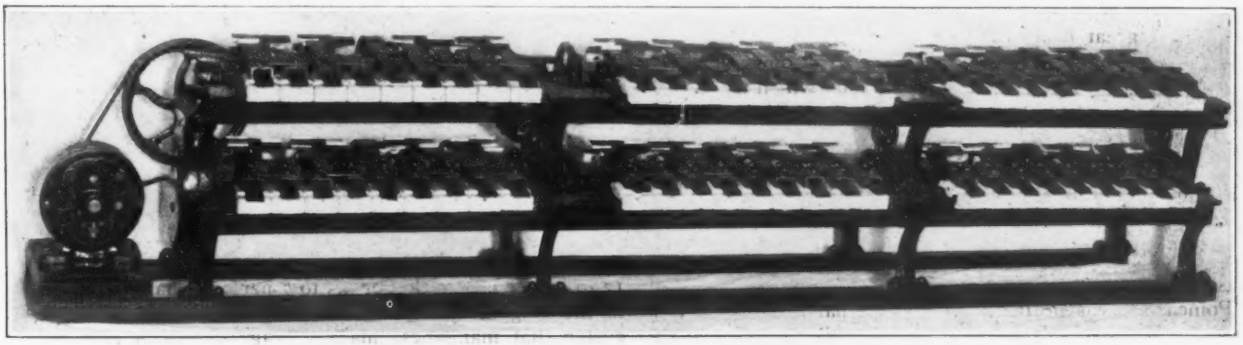
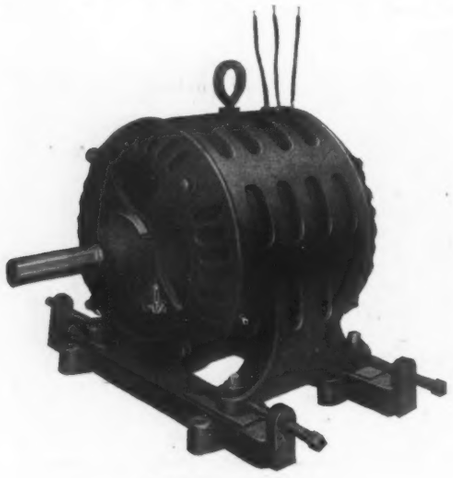


Fig. 1—Sixty-Eight-Circuit High-Speed Flasher.

cuiting rings are arranged to act as blower vanes, causing air to be forced through the coils of the motor and tending to increase the range of overload without excessive heating. The slots of the rotor and stator are of the semi-inclosed type. Form-wound coils are used and these are immersed in an insulating and moisture-repelling compound after the winding is complete. Bearings, frame, shaft, etc., are designed along lines similar to those found to be successful in the direct-current motors made by the company. A motor speed of 1800 r.p.m. is the highest standard speed listed, but a new 3600 r.p.m. motor for direct drive of high-speed machines, such as vacuum cleaners, etc., has been developed. Special care is taken and tests are made to insure a perfectly balanced rotor, so necessary in motors of such high speed.



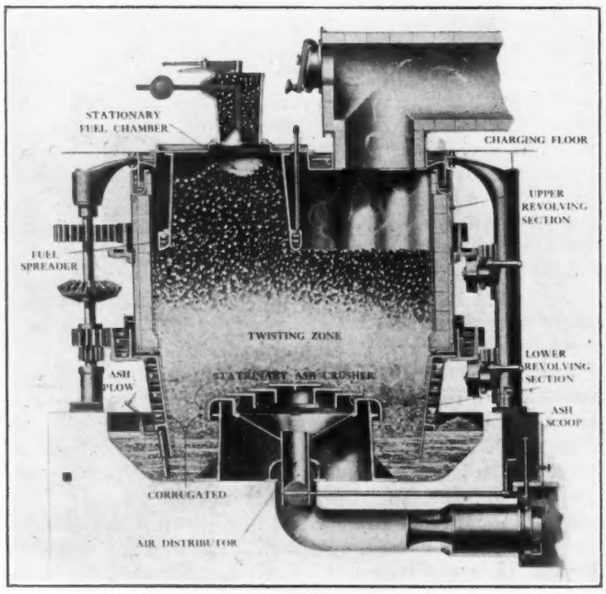
Polyphase Motor.

ROTARY BITUMINOUS GAS PRODUCER.

A novel form of bituminous gas producer has been developed and placed on the market by the Chapman Engineering Company, Mt. Vernon, Ohio. The chief distinctive feature of this producer is the method employed to agitate the fuel bed, which consists of revolving one-half of the bed over the other, thus setting up a twisting or shearing action throughout the entire fuel chamber. The shell is divided horizontally through the hot zone into an upper and a lower section, and the sections are made to revolve in the same direction, but at different speeds. Each section of the wall tends to carry with it that portion of the fuel bed which it surrounds. No agitating arms are employed. The fuel chamber is stationary and has no bottom. It has a capacity of 1000 lb. of coal, or enough to last for about half an hour. The lower edge of the chamber is water-cooled. Mechanical means are employed to feed and spread the fuel, agitate the entire bed and remove the ashes.

As the revolving fire bed comes under the fuel chamber a fresh supply of fuel is spread over the surface, thus constantly keeping the level of the fire bed up to the bottom of the chamber. The lower edge of the fuel chamber is beveled for the purpose of producing a down-stroking effect upon the fire bed as it passes under it. The manufacturers claim that the rotation of the fuel bed tends to prevent the formation of blow holes and clinkers. The first step in the process of mechanical ash removal is the grinding of the ashes between the sides of the stationary corrugated air pockets and the revolving corrugated wall of the lower section. After the ashes have been crushed they are forced up to the top of the ash pan by three adjustable ash plows which are kept continually in operation. As fast as the ashes are lifted to the surface of the water in the ash pan they are automatically scooped up and carried to the required point for automatic discharge.

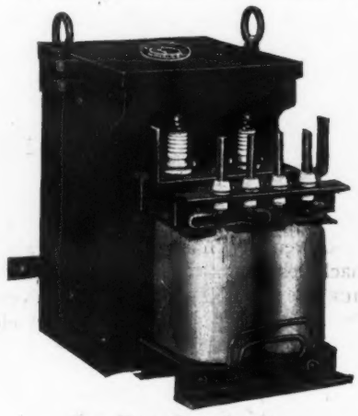
The capacity of this producer, according to the manufacturers' claim, is one ton of coal, completely gasified, per hour. The supporting rollers for the moving parts run on high-carbon chilled-steel pins and are provided with brass bushings. Separate rollers are used to take care of the side thrust, and all rollers are mounted in pairs in equalizing yokes. The bearings are provided in every case with large oil wells, and the faster gears run in oil. Steel castings are used extensively both in the gears and throughout the remainder of the construction. The manufacturer claims for this producer that it gives both unusually high quality of gas and remarkably uniform quality. The average results of a two weeks' test on one of these producers installed in a steel plant at Cleveland, Ohio, as reported by the manufacturer, gave 150.8 heat units per cubic foot of gas with a maximum variation of 2.54 per cent. Mr. W. B. Chapman, 11 Broadway, New York City, is the inventor of this type of producer.



Rotary Bituminous Gas Producer.

POLE-TYPE TRANSFORMER.

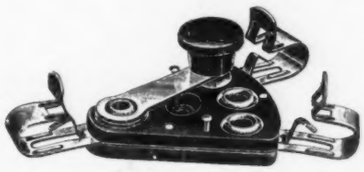
The Foster Engineering Company, Ltd., Wimbledon, London, S. W., has placed on the market a number of special types of transformers such as furnace transformers, instrument transformers, bell-ringing transformers, etc. The accompanying illustration shows a 10-kw, 2000/200-volt, oil-filled, pole-type transformer.



Pole-Type Transformer.

BATTERY SWITCH.

A simple and reliable switch for the battery and magneto is illustrated herewith. It is a two-circuit switch equipped with spring binding posts and can easily be installed and used for any wire connections. The base is of hard black



Two-Circuit Switch.

fiber. There is no wiring inside the switch all parts being riveted together so that they cannot become loosened by rough usage. These switches are manufactured by the Fahnestock Electric Company, 129 Patchen Avenue, Brooklyn, N. Y.

EXHIBITS AT NEW YORK ELECTRICAL SHOW.

The New York Electrical Exposition and Automobile Show which opened at the New Grand Central Palace, New York City, on Oct. 9 and which will remain open until Oct. 19, is the largest of its kind thus far given. There are well nigh onto 100 exhibits on the three floors of the building given over to the show and a brief description of those in place on the opening night is given below:

Acorn Manufacturing Company, New York, is making the New York Edison Company's tin-bank souvenir.

Addressograph Company, Chicago, has in operation a number of its machines which print addresses from plates of durable type.

American Clay Products Company, New York, makes a display of sample sections of vitrified conduit for underground distribution work.

American Museum of Safety and Sanitation, New York, has on exhibition an array of photographs, models, etc., dealing with the broad subject of safety and imparting to the visitor some impression of the humane work in which it is engaged.

Anderson Brothers, Paterson, N. J., have an interesting demonstration of the spinning of silk.

Anderson Electric Car Company, Detroit, Mich., displays an electric brougham seating five persons in which all passengers face forward and a 1913 model roadster.

Atlantic Vehicle Company, New York, is showing the chassis of a 2-ton truck.

Automobile Journal Publishing Company, New York, has three of its automobile periodicals on view.

Baker Motor Vehicle Company, Cleveland, Ohio, has on exhibition a new model brougham and the chassis of a 2-ton express wagon.

Bell Electric Motor Company, Garwood, N. J., is showing a number of self-starting single-phase motors and a line of two-phase machines.

Boston Pencil Pointer Company, New York, is showing a motor-driven pencil sharpener and also some hand-operated machines.

Brunswick Refrigerating Company, New Brunswick, N. J., displays a two storage compartment electric refrigerator which also is capable of making from 15 to 20 lb. of ice daily.

Buffalo Electric Vehicle Company, Buffalo, N. Y., is showing several models of the "Buffalo Electric" automobiles.

Burroughs Adding Machine Company, New York, is exhibiting a number of its adding machines for diversified uses.

Canton Rubber Company, Canton, Ohio, displays a line of rubber goods intended for electrical use, together with rubber goods of a general nature.

Champion Electric Vehicle Company, New York, displays an electric vehicle with battery located under the seat and the chassis of an electric truck with an under-slung battery.

Comptograph Company, Chicago, is showing a line of electric and hand-operated calculating machines.

Consolidated Telegraph and Electrical Subway Company, New York, N. Y., depicts a model manhole illustrating the methods of underground distribution in New York City.

Croker National Fire Prevention Engineering Company, New York, is showing fire extinguishers, safety devices and fireproof office equipment.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has an imposing display of electrical heating apparatus.

Dalton Adding Machine, Poplar Bluffs, Mo., is exhibiting through Oscar Muller Company, the New York agents, electrically operated calculating machines.

Decorus Manufacturing Company, New York, is demonstrating the aerograph, which sprays colors on delicate fabrics.

Edison Storage Battery Company, Orange, N. J., shows an assortment of Edison cells, an alternating-current rectifier and an automatic voltage regulator.

Electric Controller & Manufacturing Company, Cleveland, Ohio, has on exhibition a number of automatic motor starters and controllers.

Electric Storage Battery Company, Philadelphia, Pa., is making a display of "Chloride," "Tudor," "Exide" and "Iron-Clad" cells, together with a mammoth end-cell switch.

Electrical Review & Western Electrician, Chicago, Ill., is distributing copies of recent issues and contrasts old volumes with those of to-day.

Electrical Testing Laboratories, New York, is making a display of its methods of testing paper, and also exhibits developments in watt-hour meters, illuminating shades and reflectors.

Electrical World, New York, is distributing copies of current numbers and reflects in its volumes the strides made by the central-station industry from the beginning to the present time.

Ensign Manufacturing Company, Boston, is demonstrating motor-driven calculating machines.

Eureka Vibrator Company, New York, is exhibiting a number of vibratory massage machines for operation from central-station or battery circuits.

Eureka Vacuum Cleaner Company, New York, is demonstrating its various household vacuum cleaners.

Federal Sign System Electric, Chicago, Ill., makes a display of sample signs, as well as an electric power table for kitchen use.

General Acoustic Company, New York, is showing dictagraphs and an acousticon with electrically controlled sound regulation.

General Electric Company, Schenectady, N. Y., has an elaborate display of heating apparatus, incandescent lamps and general household devices.

General Motors Truck Company, Pontiac, Mich., is showing the chassis of a 5-ton truck, the battery of which is carried above the frame.

General Vehicle Company, Long Island City, N. Y., exhibits a number of commercial trucks, together with an industrial truck for dock use.

Gould Storage Battery Company, Depew, N. Y., has on display a number of its batteries, together with sample plates.

Grosser Knitting Machine Company, New York, is exhibiting foreign-made hosiery machinery.

Gudeman & Company, New York, exhibits all kinds of electric flowers for decorative purposes.

Habirshaw Wire Company, Yonkers, N. Y., displays in its booth boards showing samples of its wires, cables, etc.

Wallace B. Hart, New York, shows in operation a Copeman automatic electric cook stove and a Dodge & Zuill easy motor washer.

Helion Electric Company, Newark, N. J., is demonstrating its electric toasters, irons and cigar lighters recently placed on the market.

Hurley Machine Company, New York, has on exhibition a complete electric home laundry, comprising "Thor" washing machines, an electric drier and an ironing machine.

Independent Electrical Supply Company, New York, which handles a complete line of electrical devices, distributes literature on its appliances from its booth.

H. W. Johns-Manville Company, New York, is making a demonstration of the "Audiffren-Singrun" refrigerating machine, together with a number of its asbestos and electrical specialties.

Kalor Company, New York, shows an instantaneous hot water heater.

Kinetic Engineering Company, Philadelphia, Pa., is making a display of electric organ blowing apparatus.

Lansden Company, Newark, N. J., is showing the chassis of a 1913 model 1-ton gear-driven truck; a combination flushing, sprinkling and road-oiling wagon, and a large truck equipped with a bottle crowning machine.

Lighting Studios Company, New York, is showing a full line of moonstone glass reflectors, diffusing spheres and decorative globes.

Mail-Om-Meter Company, Detroit, is displaying electrically driven sealing, counting and stamping machines for office purposes.

Meacham Addressing Machine Company, New York, has an exhibit of addressing and wrapping machines.

Metropolitan Engineering Company, Brooklyn, N. Y., exhibits meter and service protective devices, high-tension fuses and cut-outs, and protectors for transformer secondary networks.

Mead-Morrison Manufacturing Company, New York, exhibits a ½-ton orange peel grab bucket, connected to a double-drum electric hoist.

Monarch Vacuum Cleaner Company, New York, has a number of demonstrators pointing out the advantages of its vacuum cleaners, which are shown in operation.

Philip Morris & Company, Ltd., New York and London, is exhibiting a miniature tobacco plantation and cigarette factory and a complete line of its products.

J. L. Mott Iron Works, New York, has on exhibition a number of lighting standards for luminous arcs, inclosed arcs and tungsten lamps.

National Electric Lamp Association, Cleveland, Ohio, displays samples of its products, ranging from miniature to large incandescent lamps.

New York Electrical School, New York, is showing photographs of the school and exhibits of work done by the pupils.

New York Steam Service Company, New York, is exhibiting photographs of buildings furnished by steam from its mains and managed by its supervision bureau.

Nelson Valve Company, Philadelphia, Pa., displays an assortment of valves of all sizes.

Dr. Emilio Olson is exhibiting a model of his scientific farm.

Otis Elevator Company, Yonkers, N. Y., demonstrates its reversible inclined elevator for carrying either passengers or freight from floor to floor in either direction.

Pass & Seymour, Inc., Solvay, N. Y., displays a sample board on which are mounted P. & S. key and keyless sockets and lighting specialties.

Private Estate Coffee Company, New York, has electric coffee roasters and grinders in operation.

Philadelphia Electric Storage Battery Company, Philadelphia, Pa., exhibits a number of its thin-plate batteries.

Regina Company, Rahway, N. J., is exhibiting four models of the Regina vacuum cleaner, two of which are motor driven.

Rex Sales Company, New York, in its booth shows the various goods manufactured by the Vulcan Electric Heating Company, the washing machines of the Brokaw-Eden Manufacturing Company and the L. B. Allen soldering pastes.

Roneo Company, New York, has an exhibit of office equipment, including a motor-driven letter copier.

Rosenfield Manufacturing Company, New York, is demonstrating the "Magic" electric-suction cleaner.

Runkel Brothers (Inc.), New York, are showing chocolate making and wrapping machinery in operation.

Shannon Manufacturing Company, New York, is showing domestic laundry equipment, including washers, dryers and irons.

Shelton Electric Company, New York, is exhibiting its various vibratory massage machines, hair dryers and therapeutic devices.

Simplex Electric Heating Company, Cambridge, Mass., through its New York agent, Mr. Roger Williams, makes a comprehensive display of its electric heating and cooking apparatus.

Standard Electric Incubator Company, New York, has a line of electric incubators and some of its live products on exhibition.

Stock Quotation Telegraph Company, New York, is showing a number of tickers in operation on its regular circuits.

Straight Filament Lamp Company, New York, displays, in addition to its lamps, different types of reflectors and fixtures.

Studebaker Corporation, South Bend, Ind., has on exhibition a 5-ton truck and a 1000-lb. delivery wagon, in addition to a 1913 2-ton model.

Terry Steam Turbine Company, Hartford, Conn., shows small vertical and horizontal steam turbines connected to motors and the rotor of a turbine unit.

William Truswell & Son, New York, are showing photographs of electrical contracting work done by them.

Twin Volute Pump & Manufacturing Company, Irvington, N. J., is showing a number of motor-driven turbine pumps.

Universal Electric Welding Company, New York, has on display a number of Thomson welding machines, in addition to a display board containing samples of welded products.

Vacuna Sales Company, New York, is demonstrating the "Vacuna" turbine vacuum cleaner, which is fitted with a "universal" motor.

Wagner Electric Manufacturing Company, St. Louis, Mo., is displaying the Wagner converter for charging storage batteries, a rectifier for automobile lighting and ignition sets, in addition to its unity power factor single-phase motor, and a line of switchboard and portable instruments.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., exhibits a complete line of heating devices for both industrial and domestic use, small motors, incandescent lamps, etc.

Weston Electrical Instrument Company, Newark, N. J., shows a complete array of portable and miniature instruments, switchboard meters and instrument transformers.

Ward Motor Vehicle Company, New York, is displaying an electric delivery wagon.

Xanthos Candy Company, Jamaica, L. I., is giving samples of its candy and is operating a motor-driven candy puller.

Industrial and Financial News

THE general trade situation continues to improve at the same high rate that has characterized its advancement during the past few months. Demand for early delivery is being made of manufacturers of all lines of material. One of the most encouraging features of recent weeks is the more uniform state of activity shown in all parts of the country. Bank clearings last week were the largest since those in the week ended Jan. 6, 1910. Car shortage is being commented upon very freely. A distinct tone of enthusiasm and progress is noticeable in reports from many branches of the electrical industry. Business conditions in the majority of localities served with electrical energy from the mains of Byllesby properties are reported as very promising, and substantial increases are being made in the rates of new business secured by the various companies. Local second-hand dealers, contractors, manufacturers and dealers in electrical equipment, as noted below, are receiving a much better volume of inquiries at present than in the past few months, and gains are shown in the business of the General Electric, Western Electric and Allis-Chalmers companies. The September report of the Copper Producers' Association showed a marked increase in surplus stocks, which may be regarded in a favorable light, as it may prove a means of reducing prices for the metal to levels that will be attractive to consumers.

Allis-Chalmers Company Makes Favorable Showing.—The reorganization committee of the Allis-Chalmers Company has sent to the holders of certificates of deposit for the company's first mortgage bonds and preferred and common stock a report covering operations of the company from Jan. 1 to Aug. 31, 1912. After deducting costs of operation, maintenance and depreciation, excepting interest on bonds, this shows profits for June of $25,642; for July of $66,984, and for August of $48,471. The average monthly sales billed during the last three months exceeded the average of the first five months by 17 per cent. The average monthly orders booked for these three months exceeded the average of the first five months by 64 per cent. Unfilled orders on hand at various dates were as follows: Dec. 31, 1911, $3,453,085; May 31, 1912, $3,689,506; and Aug. 31, 1912, $5,195,669. Otto H. Falk, the receiver, advises that overhead, administration and selling expenses have been reduced by an average of about $40,000 a month as compared with those in the last few years. A report of the company's financial condition as of Aug. 31, 1912, made by the receiver, shows current assets of $9,526,954, of which $1,480,798 is cash; $4,328,779 inventories, and $3,717,377 is in accounts receivable. The total liabilities are given as $2,198,779, leaving a surplus of $7,328,175. This is $198,000 in excess of that reported by the company on Dec. 31, 1911. In conclusion the committee states: "The foreclosure suits in the various jurisdictions are all at issue and will be pressed for decrees of foreclosure and sale as early as practicable." Deposits with the committee as of Oct. 7 comprise 93.4 per cent of the bonds, 87.7 per cent of the preferred stock, and 86.7 per cent of the common.

Westinghouse Machine Financing.—A plan has been submitted by President George Westinghouse to holders of the Westinghouse Machine Company's $4,605,000 extension notes to exchange these for thirty-year 6 per cent bonds dated Nov. 1, 1910. This plan was agreed upon at a meeting attended by creditors of the company, the chairman of the Westinghouse Electric & Manufacturing Company and President Westinghouse, representing $2,000,000 of the outstanding notes. It will become effective when 85 per cent of the holders give their consent. The management feels certain that enough noteholders to make the plan effective will accept. President Westinghouse has stated that he will purchase $1,000,000 of the thirty-year bonds, in order to provide the company with more capital. He also stated that if the plan becomes effective the company will be capable of earning in addition to its interest and sinking fund requirements, an amount available for dividends of 6 per cent or more, on its capital stock. In announcing the plan, Mr. Westinghouse stated that during the past five years the machine company has been handicapped by lack of working capital, and that it has not been able, on this account, to enjoy all of the benefits that would result from co-operation with the Westinghouse Electric & Manufacturing Company in the production and sale of turbo-generator sets. He stated further that the chairman and directors of the electric company in view of the advantages to the latter of such co-operation, have recommended to such of those in the electric company who hold notes of the machine company that they accept the refunding plan.

Second-Hand Dealers Active.—"Second-hand machinery is in far greater demand at present than it has been at any time in the past three years," said a member of one of the well-known firms of second-hand dealers this week upon returning from a trip to several of the trade centers. "Inquiries for generating equipment and motors are being received from all sorts of manufacturing plants all over the country," he continued, "which is a rather good indication of general trade expansion. The policy of retrenchment has been followed so closely in the past few years that now that trade revival is taking place, many manufacturing plants are being severely taxed by the demands upon them. Manufacturers are finding it imperative to install additional equipment in order to increase production. In other words, general business is expanding so rapidly that manufacturers are turning in large numbers to the second-hand dealers to get apparatus which the machinery builders cannot deliver as early as wanted by reason of being already crowded with orders. Prices are naturally very good at present. During my trip I found some shortage of labor in several localities, a very cheerful attitude and a general demand for early delivery of all kinds of materials in all the places I visited."

Western Electric's Business Shows 3 Per Cent Gain.—The business of the Western Electric Company for the nine months of the present year shows a gain of 3 per cent over that in the corresponding period of 1911. If this rate continues gross business of the company this year will be about $67,000,000. An officer of the company is quoted as saying: "The business of the Western Electric Company has not felt any of the large expansion that the other electrical companies have been and are experiencing, but is showing a quiet and steady growth over that of last year, which seems to be quite in line with all that was expected of this year by the officers of the company." There are now about 22,000 people on the payrolls. The company is now making preparations for the extensive business which is expected in 1913.

Wisconsin Gas & Electric Company's Officers.—J. D. Mortimer, president of the Milwaukee Electric Railway & Light Company, is president of the Wisconsin Gas & Electric Company, which as noted in these columns last week has been incorporated in Wisconsin as a holding company for properties of the North American Company in Illinois and Wisconsin, outside of Milwaukee. Robert Sealy, sales manager of the Milwaukee company, is secretary of the new concern. The capitalization of the new company, $1,200,000, is slightly more than the sum of capital stock of the constituent companies, the increase having been made for the purpose of building up the properties.

Production of Tungsten in 1911.—There was a considerable decrease in the production of tungsten ore last year, according to a report just issued by the United States Geological Survey. The falling-off is attributed to decrease in the demand for tool steels, in which the bulk of the tungsten produced is used. The production of tungsten ore in 1911 amounted to 1,139 short tons, valued at $407,985, as compared with 1,821 short tons in 1910, valued at $832,992. Only a few tons of tungsten ore are used annually for incandescent-lamp filaments. The report calls attention to the growing use of tungsten in electric furnaces, electric contacts and in targets for Roentgen rays.

Insull Interests Said to Have Purchased National Light, Heat & Power Company.—It is believed that Samuel Insull and his associates in the public utility field have purchased the National Light, Heat & Power Company, 30 Pine Street, New York, although an officer of that company would neither confirm nor deny the report this week. The company's properties, many of which are in localities near those in which the public utilities are owned by the several Insull companies are: the Charleston (Ill.) Illuminating Company; City Gas & Electric Company, Paris, Ill.; Jerseyville (Ill.) Illuminating Company; Lexington (Mo.) Gas & Electric Company; Marshall (Mo.) Light, Heat & Power Company; Pana (Ill.) Gas & Electric Company; Taylorville (Ill.) Gas & Electric Company; Central Indiana Lighting Company, Columbus, Ind., and the Twin State Gas & Electric Company which operates in Hoosick Falls, N. Y., Dover, N. H., Bennington and Brattleboro, Vt. The National company has an authorized capital of $20,000,000 common and $10,000,000 5 per cent cumulative preferred stock, of which $2,010,600 and $1,332,236, respectively, are outstanding. Its gross earnings in 1911 were $895,906, and its net earnings, $448,050. The surplus, after dividends, was $160,682. It is understood that the property will be reorganized by the new owners.

Substation Equipment for Illinois Traction Company.—The Illinois Traction Company, with executive offices at Peoria, has recently placed orders with the Westinghouse Electric & Manufacturing Company for transformers for ten substations used mostly for combined electric-service and electric-railway operation. These substations are located at Mindale, Fithian, Minooka, Utica, Spring Valley, Bloomington, El Paso, Gridley, Chenoa and Hudson, Ill. They will contain thirty single-phase transformers ranging from 10 to 100 kva in rating. All of the transformers are wound for 33,000 volts primary and 2300 volts secondary and for either 25 or 60 cycles, depending upon available energy. Each of these transformer substations is complete in itself with electrolytic lightning arresters, switchboard, etc. Some of the substations are equipped with automatic feeder regulators.

Demand for Ornamental Lighting Posts.—"The volume of inquiries coming into our office has increased wonderfully in the past month or so and while there is some disposition to postpone the closing of contracts, the outlook is very encouraging," said the head of a lamppost house this week. Commenting further upon trade conditions he said, "The fact that the inquiries are coming from all parts of the country is one of the most promising features of the situation. We find that inquiries for ornamental clusters of the three and five-light types, and for the luminous-arc standard predominate at present. Individual sales are not large, but the orders placed by merchants' associations, civic bodies, etc., make a large aggregate."

Reports of Chicago Elevated Railways.—Owing to the fact that the present fiscal year covers a period of eighteen months from July 1, 1911, an interim report was furnished to stockholders of the Metropolitan West Side Elevated Railway Company of Chicago for the six months ended June 30, 1912. This report showed gross income of $1,501,612; net income, $728,860; fixed charges, including taxes, $538,653; dividends paid, $130,618; surplus, $59,588. A similar interim report of earnings for the period ended June 30, 1912, was furnished to stockholders of the South Side Elevated Railroad Company. It showed gross income of $1,207,734; net income, $499,664; fixed charges, including taxes, $352,074; dividends paid, $127,872; surplus, $19,717.

New Officers and Directors of Bullock Electric Company.—At the annual meeting of the stockholders of the Bullock Electric Company, which is controlled by the Allis-Chalmers Company, held at Norwood, Ohio, last week, O. H. Falk and Max W. Babb, of Milwaukee, and E. T. Pardee, E. J. Clyne and E. R. Knight, of Norwood, were chosen members of the board of directors. Otto H. Falk, receiver of the Allis-Chalmers Company, was chosen president, and E. T. Pardee vice-president and general manager. L. F. Bower was re-elected secretary and treasurer. Mr. Falk succeeds Edward D. Adams, of New York, as president.

To Acquire Pacific Gas & Electric of Arizona.—The Western Cities Gas & Electric Corporation is a new public utility company which has an authorized capital of $3,000,000 in 7 per cent cumulative preferred stock and $7,000,000 in common stock. Of these, $500,000 of the preferred and $700,000 of the common are outstanding. The new concern is to acquire the capital stock of the Pacific Gas & Electric Company of Arizona, which owns and operates the gas and electric properties in Phoenix, Ariz. W. P. Bonbright & Company are offering $500,000 of the preferred stock of the Western Cities company.

Public Utility Appraisals in Ohio.—The Ohio State Tax Commission made an increase of $4,976,610 in the valuation of the 150 electric light and power plants in the State this year. In 1911 the valuation was increased from $6,437,941 to $29,472,085, and this year the figures are $34,420,895. The largest increase was in the case of the Cleveland Electric Illuminating Company, from $11,555,000 to $14,452,000. This, as recently noted, was due to the fact that the company had been granted authority to make an increase in its securities to cover future improvements.

Changes in Personnel of Baltimore Company.—At the annual meeting of the stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, on Oct. 7, the retiring directors were re-elected. The membership of the executive committee was increased at a subsequent meeting of the board from seven to nine. Charles E. Clark, of New York, resigned from the committee. New members of the latter are: Charles M. Cohn and Herbert A. Wagner, vice-presidents, and John L. Bailey, treasurer.

Walpole Rubber Company Reincorporated.—On Oct. 2 the Walpole Rubber Company was reincorporated under the laws of Massachusetts as the Walpole Tire & Rubber Company, with an authorized capital of $3,000,000 preferred and $1,500,000 common stock. In addition to its mechanical rubber products, including rubber tires, the growth of which business led to the change in name, the company is one of the largest manufacturers of insulating tapes and compounds in the world.

General Gas & Electric's Initial Dividend.—An initial dividend at the rate of 6 per cent per annum on its $1,300,000 preferred stock has been declared by the General Gas & Electric Company which was organized in June last by W. S. Barstow & Company, 50 Pine Street, New York, as noted in these columns, as a holding company for public utility properties in Vermont and Ohio. A reference to new equipment purchased for this company appeared in the *Electrical World*, July 6, page 72.

United States Independent Telephone Suit Ended.—Litigation over the losses of the United States Independent Telephone Company, of Rochester, N. Y., has been ended by an agreement through which investors in the enterprise will receive $1,500,000 or about 58 per cent of their losses. The directors of the company wil contribute the funds. Attorneys for the investors will receive 35 per cent, or $525,000 of the amount recovered.

General Electric Output Increasing.—It is understood that the General Electric Company is doing the largest business in its history, and that its gross business will closely approach $95,000,000 in the current year. New business is increasing rapidly in all of the company's lines. About 50,000 men, the largest number in its history, are now employed by the company.

Pole Dealer Reports Good Year.—In discussing business conditions recently, a lumber dealer who has been identified with the untreated wooden-pole business for a number of years stated that this year's pole business was much better than that in recent seasons. All branches of the lumber industry, he said, are very active.

American Telephone & Telegraph Earns More.—The report of the American Telephone & Telegraph Company for the twelve months ended June 30, 1912, shows a surplus available for dividends of $29,510,967, as compared with $27,080,981 in the preceding year.

Puget Sound Traction, Light & Power to Increase Stock.—A special meeting of the Puget Sound Traction, Light & Power Company will be held on Oct. 16 to authorize an increase of $1,136,000 in preferred stock.

Texas Power & Light Sells Bonds.—As was noted in these columns May 18, 1912, a number of the properties of the American Railway & Lighting Company in and near Waco, Tex., were sold at that time to the Electric Bond & Share Company, which grouped them, with several others acquired later, as noted June 8, into the new concern known as the Texas Power & Light Company. This company has an authorized common stock of $10,000,000 of which $8,500,000 is outstanding, and $3,000,000 7 per cent cumulative preferred stock of which $1,400,000 is outstanding. In order to conservatively provide in part for its future financial requirements, the authorized issue of first mortgage 5 per cent bonds was made $30,000,000. Of these $2,100,000 are now being offered jointly by Perry, Coffin & Burr, of Boston, and N. W. Harris & Company, Inc., of New York. They are dated June 1, 1912, are due June 1, 1937, and are optional at 105 and interest on any interest date (June 1 and Dec. 1.) on or after June 1, 1917. The company furnishes the entire commercial electric service in Waco, Sherman, Paris, Temple, Tyler, Cleburne, Gainesville, Brownwood, Waxahachie, Hillsboro and Bonham; the gas business in Waco, Paris, Cleburne and Brownwood, and the municipal lighting in all of these communities excepting Sherman, serving a population of approximately 125,000. Each of the communities now served by the company has its own generating station, the aggregate rated output of these being 12,000 hp. As previously noted, a large central station to serve the unified system will be built by the company in Waco.

Will Sell Telluride Power Company.—Stockholders of the Telluride Power Company at their meeting Oct. 2 voted to dissolve the company and directed the officers to take the necessary steps to that end. A resolution was adopted providing for the sale of the company at Telluride on Nov. 18. It is expected that the Utah Securities Corporation, a $30,000,000 company that is being formed by Cleveland interests, will purchase the property at the sale. The following directors and officers were chosen at the meeting: Directors—S. A. Bailey, Salt Lake; James Campbell, St. Louis; Markham Cheever, B. A. Cummings, Otto Miller, and Charles E. Niles, all of Cleveland; P. N. Nunn, Provo; J. R. Nutt, Cleveland; Daniel R. Purdy, New York; P. B. Sawyer, F. F. Steggmeyer, Salt Lake; William Story, Ouray; George P. Thomas. Officers—J. R. Nutt, president; P. B. Sawyer, vice-president and general manager; George Lomnitz, Cleveland, treasurer; Charles E. Niles, assistant treasurer; David T. Perry, Cleveland, secretary.

Contracting Business Expands.—"Our business is much better now than it has been at any other time this year, and is far ahead of what it was in the fall of 1911. We regard the prospects for the balance of the year as decidedly bright," says a representative of a large New York firm of electrical contractors and consulting engineers. "There is a great wave of new business sweeping over the country, but it has not reached this city yet to any great extent. We are doing a great deal of installation work for new buildings in the Middle West, and are now being asked to bid on a larger scale nearer home. New business in electrical contracting in Canada is also looking up. Prices are very favorable, and while competition is brisk, price-cutting is not so general as it has been in the past."

Status of Electric Bond & Share Company.—The balance sheet of the Electric Bond & Share Company as of Aug. 31, 1912, shows assets as follows: Cash on hand and in banks, $756,612; accounts receivable, $61,166; notes receivable, $1,861,915; interest accrued receivable $19,204; syndicate holdings, underwriting and advances, $2,484,682; investments, $4,806,445; total, $9,990,024. Liabilities are: Accounts payable, $14,586; dividend on preferred stock, due Nov. 1, $17,480; syndicate and contingent liabilities, $50,800; reserves, $93,756; preferred stock, $3,500,000; common stock, $3,500,000; surplus and undivided profits, $2,813,401; total, $9,990,024.

Western States Gas & Electric Bonds.—A block of $600,000 5 per cent, thirty-year first and refunding bonds of the Western States Gas & Electric Company have been purchased by White, Weld & Company who will offer them at 95 and interest. With this issue the company has $3,548,000 of these bonds outstanding. The proceeds will be used in meeting part of an expenditure of $1,142,000 made for new construction and improvements. As is well known the company operates in California and is controlled through stock ownership, by the Standard Gas & Electric Company.

Allis-Chalmers-Bullock Company Sold.—The Canadian General Electric Company, Ltd., has acquired control of the Allis-Chalmers-Bullock Company, which has a manufacturing plant at Rockfield near Montreal, Can., according to advices from that city. The Canadian company was controlled at one time by the Allis-Chalmers Company of Milwaukee, but the latter is not concerned in the deal.

Boston-Providence Electrification Assured.—The stockholders of the Boston & Providence Railroad voted unanimously, on Oct. 9, to authorize the issue of bonds to electrify the main line now leased by the New York, New Haven & Hartford Railroad between the above cities, referred to in these columns Sept. 28.

General Electric May Build a Manufacturing Plant in Mobile.—It is reported that the General Electric Company is planning to build a new branch manufacturing plant in Mobile, Ala.

SEPTEMBER STATEMENT OF COPPER PRODUCERS' ASSOCIATION.

The September statement of the Copper Producers' Association, issued on Oct. 8, compares with the August statement as follows:

	September, Pounds		August, Pounds	
Stock on hand in the United States on first of month		46,701,374		50,280,421
Production		140,089,819		145,628,521
		186,791,193		195,908,942
Domestic deliveries	63,460,810		78,722,418	
Export deliveries	60,264,796		70,485,150	
Total deliveries		123,725,606		149,207,568
Stocks on hand at the end of this month		63,065,587		46,701,374

NEW YORK METAL MARKET PRICES.

	Oct. 1 Bid.	Oct. 1 Asked.	Oct. 9 Bid.	Oct. 9 Asked.
Copper:				
Standard, spot	17.25	....	17.25	....
	£ s d		£ s d	
London, standard, spot	78 17 6		77 2 6	
Prime Lake	17.70 to 17.80		17.70 to 17.75	
Electrolytic	17.70 to 17.75		17.70 to 17.75	
Casting	17.60 to 17.65		17.50	
Copper wire, base	19.00		19.00	
Lead	5.10		5.10	
Nickel	45.00		45.00	
Sheet zinc, f.o.b. smelter	9.00		9.00	
Spelter, spot	7.65		7.65	
Tin, spot	50.00		49.75	
Aluminum:				
Prompt delivery	24.00 to 25.00		25.50 to 26.50	
Future	23.50 to 24.50		25.00 to 26.00	

OLD METALS.

Heavy copper and wire	16.50		17.00
Brass, heavy	10.50		10.25
Brass, light	8.75		8.75
Lead, heavy	4.75		4.75
Zinc, scrap	6.10		6.25

COPPER EXPORTS IN OCTOBER.

Total tons, week ending.....Oct. 8, 6,452

INDUSTRIAL SECURITIES.

Security.	Capital Stock Listed.	DIVIDEND. Per Cent.	Period.	QUOTATION. Oct. 2	Oct. 9
Allis-Chalmers t. r. 1st assess. paid	17,125,800	.....	.....	¼*	¾*
Allis-Chalmers pf.	2,083,800	.....	.....	2*	3½
Allis-Chalmers pf. t. r. 1st assess. paid	13,966,200	.....	.....	⅝	¾
Amalgamated Copper	153,887,900	1	Q	90¼	89⅞
American Tel. & Tel.	334,303,300	2	Q	144¼	143⅜
Crocker-Wheeler, c.	1,700,000	1½	Q	89*	89*
Crocker-Wheeler, pf.	500,000	1¾	Q	105*	104*
Electric Storage Battery, c.	16,074,425	.....	.....	56	56½
Electric Stor. Battery, pf.	175,100	.....	.....	.....	.....
General Electric	77,726,700	2	Q	182⅝	183½
Mackay Cos., c.	41,380,400	1½	Q	88*	87*
Mackay Cos., pf.	50,000,000	1	Q	68¼	68½*
Western Union Tel.	99,743,400	¾	Q	81	81½
Westinghouse E. & M., c.	31,685,300	1	Q	84¾	84½
Westinghouse, E. & M., pf.	3,998,700	1¾	Q	124*	126*

*Last price quoted.

Personal

Mr. Nelson Andrew Eckart has joined the engineering forces of the Oro Electric Corporation, of Oroville, Cal., and is stationed in the Humbug Valley.

Mr. B. H. Strong, formerly with the Baraboo (Wis.) Gas & Electric Company, has been appointed manager of the Antigo (Wis.) Gas Company, succeeding Mr. S. Smith.

Mr. Theodore Blech, formerly motor service agent of the Public Service Company of Northern Illinois, has been made superintendent of the Waukegan District for the same company.

Mr. Renzo Norza, who is a native of Milan, Italy, has resigned his position in the examination and reports department of H. M. Byllesby & Company, Chicago, and will return to Milan to take up private engineering practice.

Mr. Arthur Hadley, managing director, and **Mr. Bernard Price,** chief engineer, of the Victoria Falls & Transvaal Power Company, of South Africa, have recently arrived in America, and will visit some of the large electric power plants in this country.

Mr. C. Nesbitt Duffy, vice-president and comptroller of The Milwaukee Electric Railway & Light Company, addressed the Milwaukee company section of the American Electric Railway Association, on Oct. 3, on the subject of electric railway valuation.

Mr. D. E. Clough, formerly with the Great Western Power Company, San Francisco, Cal., in charge of the Concord District, has now active supervision of construction of the two hydroelectric plants of the Appalachian Power Company at Pulaski, Va.

Prof. C. A. Adams, of the department of electrical engineering at the Harvard Graduate School of Engineering Research, will give Prof. D. C. Jackson's lectures at the Massachusetts Institute of Technology during the latter's absence abroad, as noted elsewhere.

Mr. Horace Everett Shedd, formerly general superintendent of the Great Western Power Company, San Francisco, Cal., has been appointed general superintendent of the Appalachian Power Company, with headquarters at Bluefield, Va. Mr. Shedd was at the head of the construction work of both systems.

Mr. B. Magnus, general manager of the Electrolytic Refining & Smelting Company, Port Kemble, Australia, has been appointed general manager of the Mount Morgan Gold Mining Company, Queensland. Mr. Magnus will continue to act as consulting engineer to the Electrolytic Refining and Smelting Company.

Mr. Frederic Austin Warren for the past eleven years chief electrician of the Colorado Fuel & Iron Company, died at Canon City, Colo., on September 18, 1912. Prior to his connection with the Colorado Fuel & Iron Company, he was employed by the General Electric Company, and later served as electrician at the Fremont and Coal Creek mines.

Mr. H. V. Hayes, consulting engineer, of Boston, Mass., has been retained by the English telephone companies, which are about to transfer their properties to the Post Office Department of the English Government. Mr. Hayes for many years was electrical engineer of the American Bell Telephone Company and later of the American Telephone & Telegraph Company.

Mr. Emil C. Braun, who has been connected with H. M. Byllesby & Company since the organization of the company in 1902, addressed the Byllesby Luncheon Club in Chicago on Oct. 2, his subject being "European Utilities." Mr. Braun dwelt upon the extent to which electricity is used in Europe in agriculture, and predicted development in the United States in this direction.

Mr. James Graham, who, for the past ten years, has been erecting engineer for the Canadian General Electric Company, has accepted the position of general superintendent of the Yarmouth Street Railway Company, Yarmouth, N. S. The latter company operates a hydroelectric plant with an 18-mile, 22,000-volt transmission system and is planning considerable further development.

Mr. L. E. Caldwell, formerly treasurer of the Interstate Light & Power Company, Galena, Ill., has been appointed manager of the Iowa City Gas & Electric Company, which was recently purchased by the United Light & Railway Company of Chicago. For the past eight years Mr. Caldwell has been connected with the engineering and operating departments of H. M. Byllesby & Company.

Mr. Joseph L. Bradfield, contract agent of the Des Moines (Iowa) Electric Company, resigned his position, Oct. 1, to become sales engineer for the National X-ray Reflector Company, with offices at Seattle, Wash. Mr. Bradfield is a graduate of Purdue University, and before becoming associated with the Des Moines company, served with the Southern California Edison Company, of Los Angeles.

Mr. Robert L. Jaynes, retiring Tenth Jupiter of the Rejuvenated Sons of Jove, was born in Quincy, Ill., in 1866, to which his family had moved from Spottsylvania County, Virginia. He began active life as an electrician, locating in Pittsburgh, Pa., where he became representative for several manufacturers of electrical supplies. Before being selected as the chief officer of the Jovians he was statesman of the order for the Pittsburgh district.

Prof. D. C. Jackson, head of the department of electrical engineering at the Massachusetts Institute of Technology, has been granted a leave of absence until Jan. 1, to accept the invitation of the Post Office Department of the English Government to advise it in connection with the government purchase of the telephone systems. Prof. Jackson has been in consultation with the English officials on this same matter on several previous occasions. About 1500 telephone exchanges and half a million subscribers, involving a capitalization of $60,000,000, are concerned in the transaction.

Mr. Louis Cohen has recently severed his connection with the National Electric Signalling Company, where he was chief of the research department and also had charge of the Brant Rock station. He is now engaged temporarily in carrying on some private researches in wireless communication at the College of the City of New York, experimenting with the Poulsen set which was presented to the institution by Mr. Gano Dunn, past president of the A. I. E. E. Prior to becoming associated with the National company Mr. Cohen was connected for four years with the National Bureau of Standards, some of the publications of which appeared under his authorship.

Mr. Hugh L. Cooper, vice-president and chief engineer of the Mississippi River Power Company, which is making the hydroelectric development at Keokuk, Iowa, is the subject of a eulogy by Mr. William Marion Reedy in the St. Louis *Mirror* of Oct. 3. Mr. Reedy was one of the personally conducted party of St. Louisans taken to the Keokuk dam and power house by Mr. A. C. Einstein, vice-president of the Union Electric Light & Power Company, on Sept. 28. He was much impressed by Mr. Cooper and his work evidently, for he wrote of both with appreciation and discernment. A rather unusual angle of estimate is shown by the following extract: "I do not doubt that every man who was Mr. Einstein's guest last Saturday at Keokuk thinks better of all men as the result of the touch with Mr. Hugh L. Cooper and his work, and feels that there is something much to say for corporations that give play for such achievement and direct its energies into the amelioration of life for multitudes who may never give a thought to their ministrants save in complaint or condemnation that service has to be paid for."

Obituary

Dr. Morris Loeb, president of the New York Chemists Club, died on Oct. 8 at his summer home, Seabright, N. J., of typhoid-pneumonia. Dr. Loeb, who was born in Cincinnati, Ohio, May 23, 1863, was graduated from Harvard College in 1883 with the degree of A.B., and the University of Berlin in 1887. He had been prominently identified with the chemical industry, and it was due in a large measure to his untiring zeal that the present building of the Chemist Club became a reality. He was a leading spirit in many of the most prominent chemical associations in this country and abroad, in which he has served in various official capacities. Many charitable organizations also were benefited by his association with them.

Construction

ATTALLA, ALA.—The Alabama Pwr. Devel. Co., Gadsden, has taken over the property of the Etowah Lt. & Pwr. Co. for $40,000. The Alabama Co. is planning to raise the dam on Willis Creek about 10 ft., increasing the output of the plant from 1500 hp to 2000 hp.

DECATUR, ALA.—Plans are being considered for the installation of an ornamental street-lighting system in Decatur and New Decatur. It is expected that the system will connect both cities.

GLOBE, ARIZ.—Irving G. Harris, engineer, who has charge of the erection of the electric transmission line from the Roosevelt dam to the Inspiration and Miami mines, states that three power plants will be erected in the Salt River Valley to supply electricity for pumping, drainage, irrigating and lighting purpose in the valley.

MIAMI, ARIZ.—The Board of Supervisors has granted a franchise for the construction of an electric railway to extend from Miami to Globe. M. N. Amnster, of Boston, Mass., is interested.

LITTLE ROCK, ARK.—The Little Rock Ry. & El. Co. has applied to the Council for a franchise to extend its Highland Park line to the Nineteenth Street pike in the vicinity of the penitentiary.

ALAMEDA, CAL.—The Electric Light Commission has accepted the plans of M. C. Couchot for a new power house for the municipal electric-light plant. The new building will be erected on the site of the present plant. A large amount of new machinery will be installed.

ALLEGHANY, CAL.—The Bear Creek Mining Co. has made arrangements with the Middle Yuba Hydro-Electric Co. for the erection of a transmission line from its substation here to the mine on Bear Creek, a distance of 6 miles. Electrical equipment for the mine has been ordered.

BUENA VISTA, CAL.—The City Council has awarded the Fulton El. Co. the contract for installation of an electric-light plant. The cost of the plant is estimated at about $4,375.

GREENVILLE, CAL.—The Indian Valley El. Lt. & Pwr. Co. has applied to the State Railroad Commission for permission to build a hydro-electric power plant in North Canyon to use the water impounded in Round Valley reservoir.

MARTINEZ, CAL.—The Oakland, Antioch & Eastern Ry. Co. is planning to build a branch electric line to Martinez, a distance of 6 miles, as soon as the main line is completed.

OAK PARK, CAL.—Application has been made to the State Railroad Commission by the Great Western Pwr. Co. and the North Sacramento Lt. & Wtr. Co. for an order permitting the former to purchase the distributing system of the latter in Oak Park for $9,000.

REDWOOD CITY, CAL.—The City Council has adopted a preliminary resolution to submit a proposition to issue $6,000 in bonds for improvements to the street-lighting system to the voters.

RIVERSIDE, CAL.—The Pacific El. Ry. Co. is planning to rebuild the Riverside and Arlington branch.

RIVERSIDE, CAL.—The City Council has engaged Burns & McDonald, Kansas City, Mo., to make surveys of the Baldwin power site in the San Bernardino Mountains with a view of developing same to supply power to operate the municipal electric-light plant.

SNOWDEN, CAL.—Arrangements are being made to install a small hydroelectric power plant to operate a small stamp mill at the Homestake Mine in Siskiyou County.

STOCKTON, CAL.—Plans are nearly completed for the construction of the San Joaquin Valley Electric Railway from Stockton to Modesto, via Manteca, Ripon, Salida and Woods Colony, a distance of about 30 miles.

UPLANDS, CAL.—Plans are being made to give the local electric-light system a general overhauling and to install several electroliers in the business district.

WILLOWS, CAL.—Preparations are being made to erect electroliers in the business district of the city.

BOULDER, COL.—Four propositions for a renewal of the street-lighting contract and a renewal of the light and railway franchise submitted by the Northern Colorado Pwr. Co. to the City Council recently have been rejected and a committee was authorized to advertise for bids on the construction of a balance reservoir, power house, and substation for a municipal electric-light plant; also for bids on a bond issue of $40,000 authorized by the taxpayers at the election in April, 1909.

CRIPPLE CREEK, COL.—Preliminary estimates have been made by the Cripple Creek Drainage & Tunnel Co. for construction of a hydro-electric power plant near the portal of the Roosevelt deep tunnel to utilize the water power to generate electricity for the mines.

JOHNSTOWN, COL.—George H. Sethman, of Denver, has been granted a franchise to operate an electric-light plant for a period of 25 years. The town reserves the right to purchase the system at any time at the original cost of installation.

MINTURN, COL.—The Chowchilla Ranch Co. contemplates building an electric railway to connect Minturn and its property with the Tidewater and Southern railroad, a distance of 16 miles.

ANSONIA, CONN.—Steps have been taken by the Ansonia Business Men's Association for the installation of an ornamental street-lighting system on Main Street. F. T. Terry, C. F. O'Brien and John Walsh are members of the committee appointed to look into the matter.

EAST HAMPTON, CONN.—The plant and holdings of the East Haddam El. Lt. & Pwr. Co., which supplies electricity in East Hampton and Moodus, has been purchased by a Providence, R. I., concern, which contemplates raising the dam in the Salmon River at Leesville, and enlarging the plant.

NEWARK, DEL.—Arrangements are being made by the Elk River Ht., Lt. & Pwr. Co. to place its plant near Cowentown in operation again. Work will soon begin on repairing the dam which was washed away a few months ago. The company proposes to extend its transmission lines to West Grove and Avondale, Pa.

WASHINGTON, D. C.—The directors of the Arlington El. Lt. Co., Clarendon, Va., the Braddock Lt. Co. and the Braddock El. Lt. & Pwr. Co., Braddock, Va., have voted to consolidate with the Maryland & Virginia R. R. Co.

AUBURNDALE, FLA.—The question of granting a franchise for the installation of electric-light and ice plant and water-works system here is reported to be under consideration.

LAKELAND, FLA.—The citizens residing around Lake Hollingsworth for a distance of 3 miles have petitioned the City Council to extend the electric-light system around the lake to supply electricity in that district.

SANFORD, FLA.—The Sanford Mfg. Co. contemplates the installation of a small electric-light plant to supply electrical service in Sanford.

BOWDON, GA.—At an election held recently the proposition to issue $20,000 for the installation of light, water and sewer systems was carried.

GUYTON, GA.—The installation of electric-light plant and water-works system and school improvements in Guyton is under consideration.

VALDOSTA, GA.—The Valdosta St. Ry. Co. will soon award contracts for the construction of a belt line in Valdosta.

IDA GROVE, IDAHO.—The installation of an ornamental street-lighting system here is under consideration.

NAMPA, IDAHO.—Preparations are being made to double the output of the Swan Falls power plant, now owned by the Mainland interests. A transmission line will be erected to connect the Swan Falls plant with the irrigation district south of Mountainhome, Idaho.

ALEDO, ILL.—The committee of the Business Men's Association has recommended the installation of 66 ornamental street lamps in the business district.

ALTON, ILL.—The Piasa Lt. & Pwr. Co., which was recently granted a franchise here, is negotiating for the purchase of a site from the Bluff Line Railroad for its proposed power house, the cost of which is estimated at about $90,000. John J. Cummings, of Chicago, Ill., is interested in the company.

BEECHER, ILL.—The Village Board has awarded contracts to the International Harvester Co. and H. E. Kammann for the installation of the electric-light system in Beecher.

CAMBRIDGE, ILL.—The capital stock of the Citizens' Mutual Tel. Co. has been increased from $2,250 to $5,000.

CARLINVILLE, ILL.—The property of the Carlinville Tel. Co. and the Macoupin Tel. & Teleg. Co. has been purchased by E. S. Street and C. B. Cheadle, both of Henry, Ill.

CARROLLTON, ILL.—The Central Illinois Pub. Ser. Co. is planning to rebuild its plant in this city. The work will include the installation of new boilers, new machinery and rebuilding transmission lines. Transmission lines will be erected south through Kane to Jerseyville, north to Roodhouse and west to Eldred. The company is reported to have secured contracts to supply power for the drainage district on the Illinois River.

DIXON, ILL.—The Illinois Northern Utilities Co. has decided to build a large power plant, to cost $1,000,000, in Dixon. The proposed plant will supply electricity in 30 cities and villages where the company now has power stations. C. A. Munroe is general manager.

FAIRBURY, ILL.—The City Council has granted the Central Illinois Utilities Co. a 30-year franchise to operate an electric-light system here.

GIBSON CITY, ILL.—Arrangements have been made by James Hood and E. L. Allsbury with H. L. Clarke, of Chicago, Ill., to erect a transmission line from Gibson City to Paxton, to furnish electricity in that city.

GIRARD, ILL.—At a special election held Sept. 30 the proposition to sell the municipal electric-light plant was carried.

HARRISBURG, ILL.—The property of the Peoples Wtr. & Lt. Co. has been purchased by Chicago capitalists, represented by R. W. Waite, of that city.

PEORIA, ILL.—The contract for the installation of an electric-light plant at the Peoria County Farm has been awarded to the Palmer El. Co.

PETERSBURG, ILL.—Orders have been placed by Abbott Brothers, owners of the local electric-light plant for a Westinghouse, 100-kva, three-phase, 2300-volt, 60-cycle generator complete with exciter and switchboard, also for two 50-kva transformers which will be used in connection with the 16,500-volt transmission line which they are building to Tallula, Ill.

ROCKFORD, ILL.—The contract for electric wiring in the new high school has been awarded to Hebrick and Lawrence, for $3,250.

ROBINSON, ILL.—The plant and holdings of the Robinson Wtr., Lt. & Ht. Co. have been purchased by the Central Illinois Pub. Ser. Co., of Matoon.

SYCAMORE, ILL.—The City Council has awarded a contract to the DeKalb-Sycamore El. Co., whereby the latter will furnish at least 160 100-watt tungsten lamps at $23.50 each per year, and 66 magnetite arc lamps at $72.50 per lamp per year. Under the terms of the contract the city is allowed to substitute an ornamental lighting system for 3 cents per kw-hour. Electricity for operating the pumping station will be supplied for 4½ cents per kw-hour.

THEBES, ILL.—The National Motor & Supply Co. has sold its electric plant to the village of Thebes, taking in exchange the municipal electric plant, which is smaller, and $3,000.

VERSAILLES, ILL.—The local electric-light plant, owned by John G. Elliott, has been purchased by the Western Utility Co. of Chicago. Mr. Elliott has been made manager of the company.

WINDSOR, ILL.—The Village Board has granted the Central Illinois Public Ser. Co. a 50-year franchise to construct and operate an electrical distributing system here. Electricity for the system will be supplied by a transmission line from Mattoon.

BLUFFTON, IND.—The City Council has adopted an ordinance rescinding and annulling an ordinance passed a few months ago declaring for the sale of the municipal electric-light plant. The Council has decided to make extensive improvements to the plant.

BRYANT, IND.—The Marion Motor Pwr. Co. has submitted a proposition to the town of Bryant offering to extend its transmission lines here, providing sufficient patronage is guaranteed.

EAST CHICAGO, IND.—Preparations are being made by the Northern Indiana Gas & El. Co. for the construction of a large power plant at the junction of the canal and the Calumet River in East Chicago, to cost about $750,000. Part of the machinery has been purchased and contracts will soon be placed for two large turbine engines.

ELKHART, IND.—The Board of Public Works has granted the Indiana Tel. & Teleg. Co. a 25-year franchise to construct and operate a long-distance system in Elkhart.

HOBART, IND.—Bids will soon be received by the town of Hobart for the installation of a conduit wiring system for 66 ornamental lamp standards. O. L. Shore is superintendent of municipal electric-light plant.

KENDALLVILLE, IND.—The City Council is asking for bids for a Corliss engine and a belted unit or two Corliss engines for the municipal electric-light plant.

NEW ALBANY, IND.—The City Council has prepared an ordinance authorizing the Federal El. Sign System to erect modern lamp standards and wires along Main, Market, Spring, Pearl, Bank and State Streets in New Albany to provide the entire business district with an ornamental street-lighting system.

SHERIDAN, IND.—The Town Board has purchased the electric plant from L. M. Vickey, which it sold to him two years ago, and proposes to make improvements to same.

WEST LEBANON, IND.—At an election held recently the proposition to install an electric-light system here was carried.

ANKENY, IA.—The proposition to grant a franchise to the Central Iowa Lt. & Pwr. Co. in Ankeny will be submitted to a vote on Oct. 14.

DES MOINES, IA.—Application has been made to the City Council for a telephone company which proposes to operate in this city. L. W. Stanton and O. C. Schultz are promoters of the enterprise. The company will start with a capital stock of $1,000,000. The total investment will be about $2,000,000.

GREENFIELD, IA.—The proposition to issue bonds to the amount of $9,000 for extensions to the municipal electric-light plant will be submitted to the voters on Oct. 21.

GRISWOLD, IA.—The installation of an electric-lighting system is under consideration.

GRUNDY CENTER, IA.—At an election held recently the proposition to grant the Grundy Center Mutual Tel. Co. a franchise was carried. The company agrees to install a telephone system to cost about $15,000.

LAWLER, IA.—The installation of a municipal electric-light plant in Lawler is under consideration, plans for which have been prepared.

MARCUS, IA.—The Village Board has abandoned the plan to call an election to vote upon a bond issue for the construction of a municipal electric-light plant, and, it is said will grant a franchise to a private concern.

MELROSE, IA.—At an election held recently the proposition to grant a franchise to construct and operate an electric-light plant here was carried.

MURRAY, IA.—Arrangements are being made by Gilbert Johnson, who holds a franchise here, to erect an electrical distributing system in Murray. Electricity for operating the system will be supplied by a transmission line from Osceola.

NEW PROVIDENCE, IA.—Application has been made to the City Council by E. H. Lundy and J. G. Hartenberg, of Eldora, for a franchise to supply electricity for lamps and motors here. It is proposed to extend the transmission line from Union to New Providence and furnish electrical service to the farmers along the proposed line.

REDFIELD, IA.—The proposition to issue $15,000 in bonds for the installation of electric-light plant and water works system will be submitted to a vote.

WORTHINGTON, IA.—Plans are being considered for the installation of an electric-light plant in Worthington.

CHERRYVALE, KAN.—Plans are being considered for extensions to the local electric-light plant, which was recently taken over by the Kansas Gas & El. Co.

EL DORADO, KAN.—The City Council has granted the petition of the business men for the installation of ornamental street lamps in the business district, covering six blocks. Forty-eight standards carrying three-lamp clusters will be erected.

LAWRENCE, KAN.—Proposals will be received by the Regents of the Kansas State University, Lawrence, until Oct. 22 for furnishing labor and material for the erection and installation of plants for power, heat, water supply, plumbing, sewage disposal and electric lighting on the grounds of the State Fish and Game Hatchery near Pratt, Kan. Copies of plans and specifications can be seen at the office of Charles H. Chandler, state architect, Capitol Building, Topeka, and at the institution at Pratt. Edward E. Brown is secretary of Kansas State University, Lawrence.

CARLISLE, KY.—The power plant of the Carlisle El. Co., together with the exchanges of the Cumberland Tel. & Teleg. Co. and the Carlisle Home Tel. Co., of Carlisle, were damaged considerably by a fire which swept the business district of the city on Sept. 30.

KNOXVILLE, KY.—Steps have been taken by the Business Men's Club for the installation of an ornamental street-lighting system on Prince Street.

YARMOUTH, MAINE.—The Yarmouth Ltg. Co. has taken over the property formerly owned by the Yarmouth Mfg. Co., which includes the large electric-lighting plant in Yarmouth and electric transmission line from here to Freeport, which supplies electricity to private enterprises in that town. The new company proposes to enlarge the plant and make some extensions. Harry L. Cram is attorney.

AUBURN, MASS.—The Suburban El. Co. has awarded a contract for the construction of a transformer station in Auburn.

HOLYOKE, MASS.—The Lighting Department has decided to extend the electric-lighting service to Smiths Ferry as far north as the Holyoke Country Club house in the near future.

LOWELL, MASS.—An agreement has been reached between Commissioner George H. Brown and the Lowell El. Lt. Corpn., which, if approved by the Municipal Council, will give the city of Lowell a "great white way." Under the proposition submitted the Lowell El. Lt. Corpn. agrees to install 137 arc lamps on ornamental standards from the city hall to the square on Prescott Street, and Central Street to Middlesex and on Middlesex Street to the Boston and Maine depot, and will operate these lamps together with the other lamps throughout the city at a cost of $68,357 per year. The installation of the ornamental lamps is estimated at between $50,000 and $60,000, the entire expense to be paid by the company. J. A. Hunnewell is general superintendent.

LYNNFIELD, MASS.—The Lynn Gas & El. Co. is planning to extend its service to Lynnfield and will soon apply to the County Commissioners for a franchise. The Reading municipal electric-light commission has been authorized to contract with Lynnfield to furnish electricity for lighting the Center for a period of five years. At present the town is without street lighting service.

SOMERVILLE, MASS.—The committee on electric lines and lights is contemplating the installation of magnetite arc lamps on several streets in the city.

WESTFIELD, MASS.—The Amherst Pwr. Co. has been asked to submit three propositions on furnishing electricity in Westfield: (1) That the company sell to the town all the power used and the town distribute same. (2) The company to lease the municipal plant and supply electrical service to the town. (3) The company to ask for a franchise to enter Westfield, selling energy direct to the town and also to consumers using more than 50 hp. Philip Cabot, of Boston, is president.

BATTLE CREEK, MICH.—The City Council has entered into a ten-year contract with the Citizens El. Co. for lighting the streets of the city, under which the company will furnish five-lamp cluster groups, at $45 each per year, and arc lamps at $60 per lamp per year.

DETROIT, MICH.—The Public Lighting Commission is erecting a substation on Palmer Avenue, east of McDougall Avenue.

FRANKENMUTH, MICH.—Negotiations are under way between the Village Trustees and the Frankenmuth Milling Co. in connection with the installation of an electric-light plant in Frankenmuth.

GRAND RAPIDS, MICH.—The City Council on Oct. 1 adopted a resolution authorizing Mayor Ellis to appoint a commission of nine members to look into the question of municipal ownership of the street railway system. This action follows the refusal of the local street railway company to extend its lines into districts where such extensions are deemed necessary.

HASTINGS, MICH.—Plans are being considered for the installation of a municipal electric-light and pumping plant. It is probable that a proposition to issue $120,000 in bonds for this purpose may be submitted to the voters at the fall election.

MONTAGUE, MICH.—At an election held recently the proposition to grant Dr. Bailey, of Michillinda, a franchise to install an electric-light plant here was carried.

MUSKEGON, MICH.—The City Council has instructed the Muskegon Lt. & Trac. Co. to extend its tracks from Sanford Street along the Southern Avenue, a distance of 1 mile.

NORTHVILLE, MICH.—Plans are being considered for extensions to the municipal electric-light plant, including the installation of a new water wheel and 75-kw generator. Samuel Wilkinson is manager.

SAULT STE. MARIE, MICH.—An agreement has been reached between the Edison Sault Ste. Marie El. Co. and the United States Government in reference to power rights in the rapids of the St. Mary's River above Sault Ste. Marie, Mich. The government has executed a lease granting the electric company power rights in the rapids of St. Mary's for a period of 30 years, and provides for an annual rental of $25,000, the electric company being permitted to divert water sufficient to supply its present needs. The company now has an output of 2000 hp. Provision is made for future expansion by stipulation permitting the amount to be increased to a maximum of 5000 hp.

YALE, MICH.—Plans are being considered for improvements to the municipal electric-light plant.

YPSILANTI, MICH.—The boiler in the power house of the Detroit, Jackson & Chicago Ry. Co. was recently wrecked by an explosion.

ANNANDALE, MINN.—Arrangements have been made for the installation of an electric-light plant here. W. H. Towle is president of the new company and G. G. Sawyer is manager.

CLARA CITY, MINN.—Bonds to the amount of $5,000 have been voted for the installation of a municipal electric-light plant.

DEER RIVER, MINN.—Bids will be received by the Village Council until Oct. 17 for the installation of an air lift pumping plant, consisting of well, compressor, receiver, supply pipe, air pipe, motor, foundations for machinery, sewer pipe and power house. Plans and specifications are on file in the office of the village recorder, Deer River, and at the office of the Duluth Engineering Co., Paladio Bldg., Duluth, Minn. A. D. Ingersoll is recorder.

DELANO, MINN.—The Central Minnesota Lt. & Pwr. Co., which has taken over the municipal electric-light plant, proposes to rebuild same.

LUVERNE, MINN.—The Northwestern Tel. Exchange Co., which recently took over the local system, will rebuild the local exchange and install a central energy system, cables, etc., at a cost of about $20,000.

ST. CLOUD, MINN.—Bids will be received by the Public Service Co., St. Cloud, until Oct. 15, for the construction of a street-lighting system, consisting of furnishing and erecting 50 ornamental lamp standards, steel taped cable, transformers and accessories, according to plans and specifications which are on file in the office of the company, St. Cloud, and at the office of Earle D. Jackson, consulting engineer, St. Paul. Copies of plans and specifications may be secured from the engineer upon payment of $2 to cover cost of printing and mailing.

LOUISVILLE, MISS.—The Louisville Lt. Co. has been granted a franchise to construct and operate an electric-light and power plant here. Albert Y. Woodward is Mayor.

KIRKSVILLE, MO.—The proposition to issue $99,000 in bonds for the installation of a municipal electric-light plant and water-works system will soon be submitted to a vote.

RICH HILL, MO.—Improvements will be made to the municipal electric-light plant which will involve an expenditure of about $15,000 and include the installation of two 150-hp boilers, two engines, poles, wire, meters, two electric motors of 150 hp, brick smoke stack and repairs to building. Bids for the work will be opened about Oct. 21. S. B. Cole is Mayor.

CHOTEAU, MONT.—It is reported that the Great Falls Pwr. Co., Great Falls, contemplates extending its transmission lines to Choteau.

HILGER, MONT.—The Kendall Lt. & Pwr. Co. has been granted a franchise to install an electric-light system here and erect a transmission line from its power plant on Warm Springs Creek to Hilger.

THOMPSON, MONT.—The Northwestern Devel. Co. is planning to construct a large power plan in Thompson.

CLARKS, NEB.—Bids will be received by the village clerk, Clarks, Neb., until Oct. 28 for the construction in full or in part of an electric-light plant, according to plans and specifications on file at the office of the village clerk and in the office of W. E. Donner, engineer, Grand Island, Neb. Plans and specifications may be obtained from the engineer upon deposit of $5. Cost of the plant is estimated at $4,800.

CURTIS, NEB.—The contract for construction of the proposed electric-light plant has been awarded to Fred Holmes.

DONIPHAN, NEB.—At an election held recently the proposition to issue bonds for the installation of an electric-light plant and water-works system was carried.

CHATHAM, N. J.—At an election held recently the proposition to issue $35,000 in bonds for extensions and improvements to the electric-light plant and water-works system was carried.

LONG BRANCH, N. J.—The Jersey Central Trac. Co. will soon begin work on the construction of an electric railway between Long Branch and Red Bank, a distance of about 10 miles.

MONTCLAIR, N. J.—Bids will be received by Harry Trippett, town clerk, Montclair, until Oct. 14 for the electrical work for the new municipal building for use of police and fire departments, etc., according to plans and specifications on file at the office of the town clerk, 460 Bloomfield Avenue, Montclair. Copies of plans may be secured from O. F. Semsch, architect, 183 Montclair Avenue, Montclair, and 100 Broad Street, New York, N. Y. A deposit of $5 will be required, $3 of which will be refunded upon return of plans.

NEWARK, N. J.—The Newark Board of Works has decided to install a hydroelectric power plant in connection with the municipal townsite it proposes to establish at its water shed at Macopin, near Butler, N. J. The proposed plant will supply electricity for local service including lighting. Charles F. Puff, engineer board of works, is in charge.

PHILLIPSBURG, N. J.—A committee has been appointed by the Board of Trade to organize and draw up a charter for the company which proposes to establish a new electric-light plant to compete with the Eastern Pennsylvania Pwr. Co. in Phillipsburg. The company will be known as the Phillipsburg's Lt., Ht. & Pwr. Co., and will be capitalized at $125,000. The proposed plant will be equipped with two 150-kw. generating units and will cost about $77,868. J. L. Lomerson is chairman of the committee and George W. Smith, secretary.

ALEXANDRIA BAY, N. Y.—The Watertown El. Lt. & Pwr. Co., Watertown, has been granted a franchise to supply electricity for lamps and motors in Alexandria Bay. J. B. Taylor is treasurer of the company.

BROOKLYN, N. Y.—The Public Service Commission has approved of two contracts awarded by the city of New York to the Degnon Contracting Co., 60 Wall Street, New York, for construction for sections Nos. 1 and 2 of the extension of the Fourth Avenue, Brooklyn, subway. The bid for section No. 1 was $1,930,250, and for section No. 2, $1,904,171.

FONDA, N. Y.—The Public Service Commission has authorized the Fulton County Gas & El. Co., of Gloversville, to purchase the property of the Cayadutta Generating Co., Fonda, for $40,000.

FREWSBURG, N. Y.—The Public Service Commission has granted the Frewsburg Lt. Co. permission to sell to William N. Rohn all its interest in a franchise granted by the town of Carroll for furnishing electricity in that town. Further consent is given to Mr. Rohn to sell to the Carroll El. Lt. & Pwr. Co. franchises taken over from the Frewsburg El. Lt. & Pwr. Co. to exercise franchise to construct and operate an electric-light plant in Carroll Township.

FULTON, N. Y.—The Board of Public Works has decided to ask for bids for the installation of the new ornamental street-lighting system on Oneida, Cayuga, Rochester, East and West First Streets and East and West Broadway.

GENEVA, N. Y.—Plans are being considered by the Board of Public Works for placing overhead wires on Genesee Street, from Castle Street to Lewis Street, in underground conduits and also to install a new street-lighting system.

HELENA, N. Y.—The Public Service Commission has authorized Hugh Raymond to construct a power plant and exercise a franchise for furnishing electricity in the village of Helena.

PULASKI, N. Y.—The Public Service Commission has given its approval for the transfer of the control of the Salmon River Wtr. Pwr. Devel. Co. to the Niagara, Lockport & Ontario Pwr. Co., Buffalo. The latter company is authorized to issue capital stock to the amount of $750,000 for the acquisition of the stock of the Salmon River company, which is authorized to issue $5,000,000 in bonds, and to issue $2,353,000 bonds at 85 for construction of dam, transmission lines and equipment. The Niagara, Lockport & Ontario Pwr. Co. has decided to develop hydroelectric power on the Salmon River, near Syracuse, rather than to erect a new transmission line 154 miles long, from Niagara.

SYRACUSE, N. Y.—The Syracuse & South Bay R. R. Co. has received authority from the Public Service Commission to exercise the franchise granted by the town of Salina for extension of its railway along the Brewerton Plank Road in that town from the north city line of Syracuse.

UTICA, N. Y.—The Utica Gas & El. Co. is planning to build a large concrete dam on West Canada Creek at Prospect.

WAPPINGER FALLS, N. Y.—The Public Service Commission has granted the Garner Print Works and Bleachery permission to extend its lighting system in the town of Wappingers, taking in Hughsonville district, together with the village of Wappinger Falls and also to light residences in the town of Poughkeepsie. This extension provides for about 40 new street lamps.

DEVILS LAKE, N. D.—Plans are being considered for the installation of an ornamental street-lighting system on six blocks in the business district.

GRAND FORKS, N. D.—The Tri-State Tel. Co. is planning improvements to its local system, involving an expenditure of from $12,000 to $15,000.

MAYVILLE, N. D.—Bonds to the amount of $20,000 have been voted for the installation of a new electric-light plant.

MERRICOURT, N. D.—The installation of an electric-light plant in Merricourt is under consideration. George Webb is interested.

MINOT, N. D.—Bids will be received by Frank A. Wilson, secretary of the State Board of Normal School Trustees, at the office of the Valley City Normal School, Valley City, N. D., until Oct. 29 for heating, plumbing, wiring, fan ventilating, heat regulation, etc., for the normal school building and boiler house to be erected at Minot, N. D.

Plans can be seen at the office of Haxby & Gilespie, architects, Fargo, N. D.; Builders Exchange, St. Paul, Minn.; Minneapolis, Minn.; Minot, Grand Forks and Fargo, N. D.

PORTAL, N. D.—The installation of an electric-light system in Portal is under consideration.

REYNOLDS, N. D.—The installation of an electric-light plant in Reynolds is under consideration.

BARNESVILLE, OHIO.—The Village Council has granted the Barnesville Gas & El. Co. a renewal of its franchise for a period of 25 years. J. W. Bradford is president of the company.

BUTLER, OHIO.—Preparations are being made to install a new street-lighting system. The present arc lamps will be replaced with tungsten lamps erected on ornamental standards, and wire placed underground.

CLEVELAND, OHIO.—The City Council has adopted a resolution authorizing Mayor and Public Service Director Springborn to investigate the question of public ownership and operation of one or both of the local telephone systems.

CLEVELAND, OHIO.—Improvements to the municipal electric-lighting system in Collinwood, including the installation of additional machinery in plant, replacing the old arc lamps with new magnetite arc lamps, have been authorized. J. W. Springborn is public service director.

COLUMBUS, OHIO.—The Scioto Valley Trac. Co. will finance the Union Depot Co., which proposes to erect a large interurban station in Columbus, to cost about $500,000.

PAULDING, OHIO.—The City Cuncil is negotiating with the Auglaize Pwr. Co., of Defiance, for electrical energy to operate the municipal electric-light system. Extensive improvements will be necessary to the municipal plant to enable it to meet the demands made upon it, and many of the citizens favor securing current from the Auglaize plant.

CORVALLIS, ORE.—The Oregon El. Ry. Co., Portland, has been granted a franchise to operate in Corvallis.

GRANTS PASS, ORE.—The California-Oregon Lt. & Pwr. Co. is planning to build a power plant here and to erect transmission lines through the county.

HOOD RIVER, ORE.—Plans are being considered by A. Welch, of the Oregon-Washington Corpn., and associates for the construction of an electric railway through the Hood River Valley, which will ultimately be extended to The Dalles. It is reported that application will soon be made to the City Council for a franchise in Hood River.

JACKSONVILLE, ORE.—The California-Oregon Pwr. Co. is planning to erect several transmission lines, including a line to Jacksonville.

KLAMATH FALLS, ORE.—The California & Oregon Pwr. Co. has completed its transmission line to Klamath Falls and has connected with the power lines here. The company has generating plants at Prospect, on Rogue River, on the Klamath River at Klamath Falls and in the Klamath River Canyon at Falls Creek, having a total output of 110,000 hp. It is expected the company will supply electricity to operate pumps for pumping water into lands that are too high for the government canal. The company has also completed a transmission line into Butte Valley, Cal., and is planning to furnish electricity to farmers in that section to operate pumps for irrigating purposes and also for industrial purposes in southern Oregon and northern California.

WOODBURN, ORE.—The City Council has awarded the Portland Ry., Lt. & Pwr. Co. a contract for street-lighting for a period of 15 years, under the terms of which the company is to supply 140 incandescent lamps of 80 cp at $14.40 each per year.

ALTOONA, PA.—The Penn Central Lt. & Pwr. Co., is extending its transmission line from Delaney to Patton, a distance of from 10 to 15 miles, to supply electricity to mines in that vicinity, and to other industries along the line. The company also contemplates furnishing electricity to mines along the Puritan branch, which will be completed about Dec. 1. Another line will also be erected to Benscreek. The new slope of the Portage Coal Mining Co., and the mines of Irish Brothers, in the Portage field, will also use electricity furnished by the Penn Central Company.

BATH, PA.—The proposition to issue $10,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters at the fall election, Nov. 5.

HARRISBURG, PA.—Proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 12, for extension and remodeling United post office and court house, etc., including plumbing, gas fitting, heating apparatus, electric conduits and wiring system and interior lighting fixtures, at Harrisburg, Pa. Drawings and specifications may be obtained at the above office or from the custodian at Harrisburg, Pa. Oscar Wenderoth is supervising architect.

JENNERS, PA.—It is reported that the United Ht. & Pwr. Co., of Stoyestown, is planning to extend its transmission line along the Pittsburg and Philadelphia pike to this place. The company may also furnish electrical service in Ferrollton.

PITTSBURGH, PA.—The Carter El. Co. has been awarded the contract for electrical fixtures for the $250,000 bank and office building of the East Saving & Trust Co. in Pittsburgh.

GREENVILLE, R. I.—The Village Council has granted the Narragansett El. Ltg. Co. permission to erect transmission lines on the Farnum Pike, through the village of Georgiaville and Greystone annex.

MANNING, S. C.—J. Newton Johnston, of Florence, has been engaged by the Town Council to prepare plans and estimates for installation of electric-light and water-works systems.

COGGSWELL, S. D.—A franchise has been granted to R. E. Johnson and H. L. Taylor for the installation of an electric-light plant here.

KIMBALL, S. D.—A company is being organized to install a new electric-light plant here. Application has been made to the Council for a franchise to operate an electric system in Kimball. J. L. Slifer is to be president of the new company, Garnet Ashley vice-president, and Herbert Hannaman secretary and treasurer.

WATERTOWN, S. D.—The Dakota Central Tel. Co. is contemplating the installation of an automatic telephone system.

CHATTANOOGA, TENN.—Plans are being considered by Commissioner A. N. Sloan, of the Department of Streets and Sewers, for the installation of a municipal conduit system for electric wires in Chattanooga. Preliminary estimates have already been made upon the work.

MANCHESTER, TENN.—The Stone Fort Pwr. Co. has purchased the water power rights of Big Falls and Little Falls, near here. The company will soon begin work on developing the power and will furnish electricity for lamps and motors in Manchester and to towns along Nashville, Chattanooga & St. Louis Railroad. Contracts have already been signed to furnish electrical service in Tullahoma. W. G. Cummings, H. T. Brown, John Cumbley and Mrs. F. H. Wooten are interested.

HEARNE, TEX.—Mayor P. L. Brady, it is reported, is advertising for bids for the installation of an electric-light plant here.

PALESTINE, TEX.—The Palestine El. Lt. Co. is making improvements to its plant in Palestine.

TERRELL, TEX.—Arrangements have been made by the Texas Midland R. R. Co. to establish a through motor car service passenger service between Paris and Dallas, a distance of 113 miles. Trackage arrangements have been made with the Texas & Pacific Railroad for operating the motor cars over that line between Terrell and Texas, a distance of about 35 miles.

WACO, TEX.—The Southern Trac. Co. is planning to extend the Providence Heights El. Ry. to Highland Pl. in Northwest Waco.

HARTWICK, VT.—At a special town meeting held recently the citizens voted to accept the proposition of the Woodbury Granite Co. to lease the municipal electric-light plant for a term of five years. It was also voted to erect an auxiliary electric power plant at Jackson's Bridge and connect same with the present power line, the cost not to exceed $25,000.

DUBLIN, VA.—Bids will be received by the Town Council until Oct. 18 for a franchise to construct and operate an electric-light plant here. George C. Moomaw is Mayor.

POCAHONTAS, VA.—The City Council has authorized the Appalachian Pwr. Co. to install 16 additional street lamps of 100 cp and 40 lamps of 60 cp.

PUYALLUP, WASH.—The City Council has decided to investigate municipal ownership of a city lighting system before granting a franchise for lighting the city for the next five years.

SPOKANE, WASH.—The Washington Wtr. Pwr. Co. will soon begin concrete work at its dam at Long Lake, which will involve an expenditure of about $900,000. Excavation for the power plant will soon start. C. S. McCalla, of Spokane, is general manager.

TONO, WASH.—The city Tono has awarded the contract for wiring the city preparatory to starting up the new power plant to the Dings El. Co., of Centralia. The contract includes wiring of 100 houses, stores, opera house and street lamps.

MOUNDSVILLE, W. VA.—The Parrs Run Coal Co. is planning to develop 1275 acres of coal land having a daily capacity of 500 tons. The mines will be equipped with electrically driven machinery.

EAU CLAIRE, WIS.—The City Council is contemplating improvements to the street-lighting system and the installation of ornamental street-lamps in the business section of the city.

JANESVILLE, WIS.—The merchants and business men on Milwaukee Avenue are contemplating the installation of a new street-lighting system. It is proposed to use goose-neck standards.

KENOSHA, WIS.—The Wisconsin Commission has authorized the Racine Gas Lt. Co. to issue $2,000,000 in bonds and $700,000 in capital stock. Of this issue $1,308,000 in stocks and bonds are to be exchanged for properties of the Kenosha Gas & El. Co. and the Kenosha El. Ry. Co., and the remainder for repaying loans and for future extensions to the property. The Racine company will be reorganized under the name of the Wisconsin Gas & El. Co., with a capital stock of $2,000,000.

MANITOWOC, WIS.—The City Council has decided to submit the proposition to purchase the local electric-light plant to be owned and operated by the municipality to a vote at the general election Nov. 5.

DUNCANS, B. C., CAN.—The contract for construction of power plant and distributing system for the city lighting department has been awarded to C. H. E. Williams, 615 Pender Street, West Vancouver, B. C.

VANCOUVER, B. C., CAN.—Bids will be received by William McQueen, city clerk, Vancouver, until Oct. 17 for the installation of ornamental lamp standards on Main, Granville, Harris and Hastings Streets, Vancouver.

VICTORIA, B. C., CAN.—A. T. Coward, local manager of the Brit-

ish Columbia El. Ry. Co. announces that it is proposed to extend the electric-light and power system throughout the whole of the Saanich peninsula.

FREDERICTON, N. B., CAN.—The Provincial Government has authorized the water power and five acres along the banks of the St. John River at Great Falls to be transferred to the Grand Falls Co., on payment of $60,000. Below the falls only one-half of the river can be conveyed to the company, the other half being held by the crown. The company proposes to develop the power and erect pulp and paper mills, involving an expenditure of about $8,000,000.

BERLIN, ONT., CAN.—P. W. Sothman, of Toronto, formerly chief engineer of the Ontario Hydro-Electric Commission, has submitted a proposition to the Canadian Consolidated Rubber Co., of Berlin, offering to supply electricity for operating the new tire factory at 25 per cent less than it can be secured from the Hydro-Electric Commission.

BRANTFORD, ONT., CAN.—The City Council has decided to submit to the ratepayers on Oct. 25 a by-law appropriating $115,000 for the installation of a system to utilize power to be supplied by the Hydro-Electric Commission.

MIDLAND, ONT., CAN.—The Simcoe Ry. & Lt. Co., which has developed a water power at the Big Shute on the Severn River, and is transmitting electricity to Midland, Penetang and Orilla, Ont., is planning to erect a transmission line to Collingwood, Barrie and other points in Ontario. At present a duplicate transmission line is being erected from Big Shut to Waubaushene, Ont.

MILTON, ONT., CAN.—Plans are being prepared for the installation of an electric-light system here. The Hydro-Electric Commission has decided to extend its system from Brampton & Milton.

NEWMARKET, ONT., CAN.—The municipalities of Bradford, Aurora, Markham, Stouffville, Uxbridge, Port Henry, Newmarket and the townships of King and Whitechurch are negotiating with the Hydro-Electric Commission with a view of securing hydroelectric power for this district.

NORTH BAY, ONT., CAN.—Two by-laws will be submitted to the ratepayers at the municipal elections in January, one on the hydroelectric proposition for municipal light and power, the other to grant the Nipissing Pwr. Co. a 15-year franchise to supply electricity in North Bay.

PETERBORO, ONT., CAN.—A by-law authorizing the installation of hydroelectric power in Peterboro will be submitted to the ratepayers in the near future. The cost of the system is estimated at $88,000.

TORONTO, ONT., CAN.—The Toronto El. Lt. Co. is planning to install a 5000-kw turbine in connection with its auxiliary storage battery plant to provide electricity in case of breakdown in the hydroelectric system. The storage battery plant will cost about $650,000.

WINDSOR, ONT., CAN.—An agreement has been reached whereby the Sandwich, Windsor & Amherstburg Ry. Co. will improve the service on the present Windsor and Tecumseh line and for an extension of the railway further east.

SHERBROOKE, QUE.—Contracts have been awarded for the construction of electric power house for the Canadian Ingersoll Rand Drill Co.

WILKIE, SASK., CAN.—The ratepayers have approved a by-law authorizing extensions to the electric-light plant and water-works system

New Industrial Companies

THE AUTO LIGHTING CORPORATION OF AMERICA, of Norfolk, Va., has been granted a charter with a capital stock of $1,500,000. The officers are A. D. Newcomb, president; Wailes Hank, vice-president, and W. J. Simpson, secretary and treasurer, all of Norfolk, Va.

AUTOMATIC MACHINE VENDING COMPANY, of Camden, N. J., has been incorporated with a capital stock of $50,000 by I. Ferris, Jr., Camden; J. Axford, of Germantown, Pa., and J. M. Kalbach, of Philadelphia, Pa. The company proposes to do a general mechanical and electrical engineering business.

THE ELECTRIC CAR SALES AND SERVICE COMPANY, of Rochester, N. Y., has been incorporated by Max Bernstein, Minnie L. Bohrer and C. H. Leaty, Webster. The company is capitalized at $10,000.

THE FERRO-FLEX CONDUIT COMPANY, of Letonia, Ohio, has been incorporated with a capital stock of $100,000 to manufacture metal armored conduit and conductor and other articles. The incorporators are: C. C. Hubbell, E. A. Henry, C. G. Wilderson, W. G. Bess and J. G. Quigley.

THE ROCKFORD MOTOR TRUCK COMPANY, of Rockford, Ill., has been incorporated with a capital stock of $10,000 by P. A. Peterson, Levin Faust and John Ledin. The company proposes to manufacture electric and gasoline motors.

THE STERLING TROLLEY BASE COMPANY, of Newark, N. J., has been incorporated by B. Helwig, Edward L. Klump and F. Bentsen, all of 359 Oraton Street, Newark. The company is capitalized at $150,000 and proposes to manufacture sterling trolley bases.

THE TITUSVILLE ELECTRICAL SUPPLIES COMPANY, of Titusville, Pa., has been incorporated with a capital stock of $5,000. The incorporators are: William M. Measey, 1328 Chestnut Street, Philadelphia, treasurer; James B. Lichtenberger, William J. Seltzer, of Philadelphia, and Henry V. Smith, Chester, Pa.

New Incorporations

CHICO, CAL.—Articles of incorporation have been filed for the Deer Creek Pwr. Co. by Martin C. Polk, C. L. Crowder, T. H. Polk, Park Henshaw, all of Chico, and L. M. Fletcher. The company is capitalized at $1,000,000 and proposes to develop water power to generate electricity for lighting and other purposes and to impound water in reservoirs for irrigation purposes.

JACKSONVILLE, FLA.—The Home Tel. Co. has been incorporated with a capital stock of $1,325,000. Charles Blum is president, John J. Ahern vice-president, A. S. Metzner secretary, and J. W. Ingram treasurer.

CARLINVILLE, ILL.—The Macoupin County Tel. Co. has been incorporated with a capital stock of $5,000 by George B. Carey, Thomas A. Cheadle and C. B. Cheadle.

CERRO GORDO, ILL.—The Piatt County Mutual Tel. Co. has been incorporated with a capital stock of $10,000 by Frank Etnoyer, Robert Blood, John C. Wine, Frank Wolfe and George Fulk.

COLCHESTER, ILL.—The Colchester Farmers' Tel. Co. has been incorporated with a capital stock of $6,000 by Frank Stump, James M. Clayton and Louis A. Nunn.

PORTLAND, MAINE.—The American Trac. Co. has been incorporated with a capital stock of $200,000 to operate railway lines. E. W. Porter is president and treasurer; Eben W. Freeman, E. M. Walls, Charles M. Drummond, of Portland, Alexander L. Sorter, Jr., and Ackley Hubbard, of Minneapolis, Minn., are promoters.

BOSTON, MASS.—The Orswell El. Co. has been granted a charter with a capital stock of $50,000. The incorporators are: Isreal C. Orswell, Annie E. Orswell and Joseph R. Fuller.

ST. PAUL, MINN.—The Hoffman Ltg. Co. has been incorporated with a capital stock of $30,000 by W. H. Hoffman, Adams M. Lawson, of St. Paul, and Peter L. Dansingberg, of Rochester, Minn.

MANSFIELD, MO.—The Mansfield Lt. & Pwr. Co. has been incorporated with a capital stock of $10,000 by F. B. Fuson, M. W. Oliver and Perry Simonds.

LUCIEN, OKLA.—The Lucien Tel. Co. has been incorporated with a capital stock of $10,000 by J. W. Oliver, O. S. Alloway, S. H. Gaines and others.

HARRISBURG, PA.—A charter has been granted to the Daisytown El. Co., of Daisytown, and the Middle Taylor El. Co., of Middletown Township. Each company is capitalized at $5,000 and the incorporators are: P. J. Morrisey, August Weis and J. W. Blough, of Jamestown, Pa.

MOUNT HOLLY SPRINGS, PA.—The Upper Allen Township El. Co. has been incorporated with a capital stock of $5,000. Martin E. Kraybill, of Boiling Springs, is treasurer.

PHILADELPHIA, PA.—A charter has been granted to the Valley Forge El. Lt. Co., with a capital stock of $5,000, to operate in Schuylkill Township. The office of the company is located in Philadelphia.

GREENVIILE, S. C.—The River Falls Co. has been organized with a capital stock of $50,000 for the purpose of installing power, water and sewer systems. O. K. Maudlin, of Greenville, is attorney for the company.

PENNINGTON GAP, VA.—The Pennington Lt. Co. has been granted a charter with a capital stock of $3,000. The officers are: J. H. Legg, president; P. H. Marsee, vice-president, and R. L. Wood, secretary and treasurer, all of Pennington Gap.

RICHMOND, VA.—The Atlantic Pwr. & Lt. Corpn. has been incorporated with a minimum capital stock of $1,000 with privilege of increasing it to $20,000,000. Ernest Flippen is president; Thomas E. Gay, vice-president; H. H. Chalkley, secretary and treasurer, all of Richmond, Va.

SEATTLE, WASH.—The Cohassett Beach Tel. Co. has been incorporated with a capital stock of $1,000 by J. B. Benson, H. B. Waldron and W. C. Munaw.

CHARLESTOWN, W. VA.—The Virginia Pwr. Co. has been incorporated under the laws of the State of Massachusetts with offices in Boston, Mass., and Charleston, W. Va. The company is capitalized at $10,000,000 and proposes to control and utilize water power, dams and canals. The incorporators are: Herbert A. Wadleigh, Lincoln G. Ashcroft, Norman J. MacGaffin, Daniel W. Merritt and Clarence R. Veaton.

Trade Publications

CONDUIT.—The American Conduit Manufacturing Company, Pittsburgh, Pa., has printed on celluloid a rigid-conduit price list effective August 1, 1912, which will be found very useful by all present and prospective users of this company's conduit, elbows and couplings. It makes a ready reference for prices on the various sizes of conduit. The reverse side contains net prices per 100 ft. at various discounts.

MAGNETOS.—The Bosch magneto, type ZE1, for motorcycles, is the subject of the latest publication of the Bosch Magneto Company, 223 West Forty-sixth Street, New York. It is distinguished by its water-

tight construction and by the accessibility of the parts requiring attention. It produces a high-tension or jump spark, the high-tension current being generated in the winding of the rotating armature without the use of a separate induction coil or other part. The pamphlet contains information on the setting of the magneto, cable connections, oiling, detection of faults and other general matter, including a dimensioned drawing and a full-page illustration of the parts of this type of magneto.

ELEVATOR MOTORS.—Bulletin No. 1091, recently published by the Ideal Electric & Manufacturing Company, Mansfield, Ohio, has for its subject elevator motors of both direct-current and alternating-current types. It is said to be the most complete bulletin issued on the subject. The direct-current elevator motors are furnished for the standard pressures of 110, 220, 550 and 600 volts; the alternating-current motors are furnished for two-phase and three-phase circuits for the standard voltages of 110, 220, 440 and 550 volts and frequencies of 60 and 25 cycles. Fully illustrated descriptions of both these types are given, showing the operating characteristics. Various tables and curves of interest are also included.

SWITCHBOARD METERS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently issued Special Publication No. 1524, on the subject of switchboard indicating meters. It is divided into four parts, as follows: (1) "Modern Tendencies in Design;" (2) "Advantages of Induction Meters;" (3) "Westinghouse High-Grade Meters;" (4) "Theory of Induction Meters." The various meters and their uses are set forth, and the principles of operation clearly illustrated and described. With the increasing size of power plants and the concentration of generating and controlling equipment into small space, as often required in large cities, new problems arise with regard to the equipment of switchboards. This publication gives considerable information on the subject.

"YE OLD MINT."—The Frank H. Stewart Electric Company, Philadelphia, Pa., is now occupying its new building at 37 and 39 North Seventh Street, built on the site of the first United States Mint and called the Old Mint Building. The historical feature of the site is perpetuated by bronze tablets with the name of the building. A six-page folder tells about the physical features of the new Stewart home. Mr. Frank H. Stewart, president of the company, is the author of a twenty-eight-page illustrated pamphlet, entitled "Ye Old Mint," which contains a brief description of the first United States Mint, established by Congress in the year 1792, at the site of the new Stewart Building. It is a well-written and interesting historical booklet and is being sent out with the compliments of the Frank H. Stewart Electric Company.

HANDBOOK OF THE JOHNS-MANVILLE COMPANY.—The H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York, has recently printed a limited edition of its Handbook No. 409, containing new and valuable engineering data on illumination. It is divided into eleven sections, each section being printed on a loose leaf and inclosed between heavy pasteboard folders. The folders are thumb-indexed for easy reference. The leaflets and folders are inclosed within a cloth binder which is large enough to admit of future additions. The contents of the present leaflets include instructions, definitions and tables, lamp data, showcase lighting, picture lighting, cove lighting, show-window lighting, outlining and sign lighting, type-case lighting, bank illumination, lighting specialties and general applications and test reports, all fully illustrated.

Business Notes

ORNAMENTAL LIGHTING POLE COMPANY.—The offices of the Ornamental Lighting Pole Company have been removed from 17 Battery Place to 114 Liberty Street, New York City.

MR. KERN DODGE, one of the founders and for many years one of the partners of the engineering firm of Dodge & Day, has opened an office in the Morris Building, Philadelphia, where he will devote himself to the engineering and financing of public service properties. His office is in the suite with the banking firm of William A. Read & Company.

COLUMBIA INCANDESCENT LAMP WORKS OF GENERAL ELECTRIC COMPANY.—The General Supply Committee of the United States Treasury Department has awarded to the Columbia Incandescent Lamp Works of General Electric Company a contract covering $150,000 worth of Columbia Mazda, Gem and Tantalum lamps. These are to be supplied to the Navy, Treasury, War and other departments of the United States Government for the fiscal year ending June 30th, 1913. This is the third consecutive year that the supplying of a large portion of the Government lamp requirements has been given to the Columbia Incandescent Lamp Works.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCT. 1, 1912.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,039,685. POWER-TRANSMISSION DEVICE; V. G. Apple, Dayton, Ohio. App. filed Dec. 26, 1911. Motor generator with two reversible drive shafts.

1,039,691. LOCOMOTIVE FRAME; G. Bright, Wilkinsburg, Pa. App. filed Feb. 23, 1912. Side frame castings adapted to accommodate different arrangements of motors.

1,039,717. HIGH-FREQUENCY ELECTRICAL CONDUCTOR; R. A. Fessenden, Brant Rock, Mass. App. filed Jan. 7, 1911. Special multiplex strip winding.

1,039,722. KNOCK-OUT CLOSURE IN WALL BOXES; J. M. G. Fullman, Pittsburgh, Pa. App. filed Dec. 2, 1910. The knock-out is secured only at a number of spaced units.

1,039,732. ELECTRIC FURNACE; E. A. A. Grönwall, A. R. Lindblad, O. Stalhane, Ludvika, Sweden. App. filed Mar. 2, 1909. The charge is introduced through the top past the electrodes.

1,039,744. RAILWAY SIGNALING; J. S. Holliday, Wilkinsburg, Pa. App. filed May 8, 1912. For single track system between sidings.

1,039,773. TELEPHONE SWITCH BOARD; E. S. McLarn, East Orange, N. J. App. filed Oct. 7, 1910. Sectional operator's desk.

1,039,767. SYSTEM OF ELECTRICAL DISTRIBUTION; P. M. Lincoln, Pittsburgh, Pa. App. filed January 3, 1906. Railroad system with sections supplied with currents of different characters.

1,039,799. SUSPENSION CHAIN FOR HIGH-PRESSURE ELECTRIC TRANSMISSION LINES; C. M. E. Priestley, Paris, France. App. filed Dec. 20, 1910. Made up of saddle-shaped links.

1,039,810. CUT-OUT FOR ELECTRIC HEATING DEVICES; E. E. Rose, Swissvale, Pa. App. filed Nov. 8, 1909. Automatic thermol switch for sad irons, etc.

1,039,851. METHOD AND APPARATUS FOR THE CARRYING OUT OF GAS REACTIONS BY MEANS OF AN ELECTRIC ARC; G. Wagener, Schlebusch-Manfort, Germany. App. filed Nov. 22, 1911. Gas is passed through an air-tight reaction chamber.

1,039,852. METHOD OF AND APPARATUS FOR CARRYING OUT GAS REACTIONS BY THE USE OF AN ELECTRIC ARC; G. Wagener, Schlebusch-Manfort, Germany. App. filed Nov. 22, 1911. The reaction is carried out under pressure.

1,039,882. ELECTRICALLY-HEATED FLAT IRON; R. W. Baker, Newark, N. J. App. filed Apr. 30, 1912. The heater is within the iron.

1,039,907. SECONDARY BATTERY; A. H. Darker, Blackheath, England. App. filed Feb. 12, 1910. Staggered supports for the plates.

1,039,918. TROLLEY-WHEEL RETAINER; J. H. Finch, Jr., Dorchester, Mass. App. filed Sept. 25, 1911. The wheel rises as it passes around the curve.

1,039,925. ALTERNATING-CURRENT MEASURING DEVICE; B. Gati, Budapest, Austria-Hungary. App. filed July 20, 1907. Improvement on Kenelly "baretter" method.

1,039,949. PRIMARY CELL; C. & B. Jaeger, Los Angeles, Cal. App. filed Mar. 6, 1912. Ventilated cell with improved depolarizer and electrolyte.

1,039,955. OUTLET BOX; J. Keefe, Boston, Mass. App. filed Oct. 17, 1910. Knock-out opening with two sets of gripping teeth of different lengths.

1,039,975. TROLLEY; C. A. Lindberg, Bradford, Pa. App. filed Aug. 7, 1911. Self-lubricating bearing.

1,039,976. PORTABLE STEAM OR HOT-WATER RADIATOR; A. R. Little, Stockton, Cal. App. filed July 5, 1910. Connected main and auxiliary drums of special form.

1,039,988. CONTROLLING APPARATUS; E. C. Molina, East Orange, N. J. App. filed Sept. 14, 1911. Electromagnetic automatic telephone selecting switch.

1,039,996. SIGNALING MEANS FOR FIRE ALARM; G. Noack, Charlottenburg, Germany. App. filed July 10, 1908. For automatically replacing central-station apparatus after an alarm.

1,040,008. REFLECTOR; A. E. Pike, Longbeach, Cal. App. filed July 17, 1911. For electric glower lamp, Nernst or Mazda type.

1,040,043. ELECTRIC HEATER; F. H. Smith, Yonkers, N. Y. App. filed May 10, 1911. Multiple-unit heater for street cars, etc.

1,040,050. HIGH-POTENTIAL INSULATOR; L. Steinberger, New York, N. Y. App. filed June 6, 1910. For oil switches, etc.

1,040.055. BATTERY; A. E. Thompson, Hastings, Col. App. filed Dec. 18, 1911. Reinforcements of the jar.

1,040,107. CONNECTING TERMINAL; A. J. Allen, New York, N. Y. App. filed Aug. 12, 1911. Cord and binding screw attachment.

1,040,110. SYSTEM OF TRANSMITTING IMAGES TO A DISTANCE; A. C. & L. S. Anderson, Copenhagen, Denmark. App. filed Dec. 16, 1909. Color-selecting prism, screen and selenium cell.

1,040,116. APPARATUS FOR THE MANUFACTURE OF INCANDESCENT-LAMP FILAMENTS AND HEATERS; R. W. Baker, New York, N. Y. App. filed Aug. 23, 1911. Automatic vacuum and flasher control.

1,040,123. OZONIZER; H. E. Beck, Chicago, Ill. App. filed July 25, 1911. Blower type of fan and electric discharge.

1,040,131. ELECTRIC-LAMP SOCKET; A. C. Both, New York, N. Y. App. filed Dec. 2, 1911. Center contact and circuit terminal.

1,040,132. MECHANICAL MOVEMENT AND ELECTRIC-LAMP SOCKET; T. A. C. Both, New York, N. Y. App. filed Dec. 30, 1911. Special-shaped switch operating parts.

1,040,144. ELECTRIC SIGNALING DEVICE; F. W. Cole, Newton Mass. App. filed Dec. 22, 1910. Key-controlled switch.

1,040,150. INDICATOR FOR INCLOSED FUSES; R. C. Cole, West Hartford, Conn. App. filed June 10, 1911. Cartridge type.

1,040,151. OPEN-LINK FUSE CARRIER; R. C. Cole, Hartford, Conn. App. filed Aug. 3, 1912. To be inserted in the usual spring clips provided for a cartridge-type fuse.

1,640,197. ALARM; J. Hartley, Philadelphia, Pa. App. filed July 30, 1908. Mercury thermometer.

1,040,212. TROLLEY-WIRE SWITCH OR FROG; J. Kirby, Douglas, Ariz. App. filed May 3, 1912. Guard device.